NORTHERN VIRGINIA COMMUNITY COLLEGE

ECONOMIC OVERVIEW & PROGRAM GAP ANALYSIS

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PREPARED BY EMSI IN COLLABORATION WITH NORTHERN VIRGINIA COMMUNITY COLLEGE
OFFICE OF INSTITUTIONAL EFFECTIVENESS AND STUDENT SUCCESS INITIATIVES
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EXECUTIVE SUMMARY

Northern Virginia Community College (NOVA) serves a region in Northern Virginia (Alexandria City, Arlington, Fairfax, Fairfax City, Falls Church City, Loudoun, Manassas City, Manassas Park City, and Prince William) and Washington, DC. This report outlines the economy of this region and provides a "gap" analysis to determine how well the college's program offerings are satisfying regional workforce demand. The report also offers recommendations for new program development. The following are some of the key findings of the analysis:

OVERVIEW OF REGIONAL ECONOMY

- The economy of the region served by NOVA ("the NOVA Service Region") is primarily driven by three industries: Government; Professional, Scientific, & Technical Services; and Health Care & Social Assistance. All three added new jobs between 2009 and 2014, and all three industry sectors are projected to continue to grow through 2024. Overall the regional job growth is expected to be 16% over the next decade.
- Between 2014 and 2024, the highest number of average annual job openings for workers with postsecondary certificates and above are projected to occur within business & financial operations occupations, computer & mathematical occupations, and office & administrative support occupations.
- Many high-skill occupational categories are projected to see steady job growth over the next ten years, including computer & mathematical occupations (27% job growth), healthcare practitioners & technical (20% job growth), and architecture & engineering operations occupations (16% growth).
- Approximately 17% of residents in the NOVA Service Region commute outside the region for work and approximately 36% of the NOVA Service Region workers reside outside the region, indicating that there are some economic links between the region and the surrounding communities for both in-commuters and out-commuters.
- The educational composition of the adult population in the NOVA Service Region (people age 24 and older) has seen only minor shifts in recent years. Between 2009 and 2014, the percentage of adults with less than a high school diploma has gone up by 0.8 percentage points. Meanwhile, the proportion of the adult population with a "High school diploma" or higher levels of education decreased marginally.

PROGRAM GAP ANALYSIS

- A total of 50 institutions in the NOVA Service Region offered associate's degrees and postsecondary certificates between 2011 and 2013. All together, these institutions produced an average of 12,972 completers per year. Of these, 57% graduated from NOVA.
- Of the postsecondary certificate programs offered by NOVA, those facing the greatest workforce gaps (i.e., an undersupply of workers in the occupations related to the programs) are General Cooking and Related Culinary Arts, General Construction Trades, and Child Care Provider/Assistant.
- The associate's degree programs at NOVA that are facing the greatest workforce gaps are General Construction Trades, General Business Administration & Management, and Child Care Provider/Assistant.
- At the postsecondary certificate level there were significant surpluses in Clinical/Medical Laboratory Technician and Massage Therapy/Therapeutic Massage.
- For the associate's degree analysis, Biological & Physical Sciences, Criminal Justice/Law Enforcement Administration, and Clinical/Medical Laboratory Technician had the highest surpluses.
- Some of the same programs offered by NOVA are undersupplied at the bachelor's degree level. Computer Science, General Businsess Aministration & Management, and Information Technology are the top gaps at this education level.
- New areas of opportunity include: heavy & tractor-trailer truck drivers; air traffic controllers, and audio & video equipment technicians. Healthcare related occupations like licensed practical & licensed vocational nurses, dental assistants, surgical technologists also appear to be undersupplied. There are many IT jobs in the area that are undersupplied at the bachelor's degree level as well.

INTRODUCTION

Community colleges face many challenges in their efforts to identify the training needs of their service regions. They must account for regional economic trends and the changing quality of the workforce. Furthermore, as technology progresses, colleges need to address the increasingly complex and specialized skills required by employers. In light of these dynamics, an understanding of the regional economy and the demand for skilled labor is vital to the planning efforts of colleges seeking to adapt their program offerings to the requirements of an ever-changing workforce.

To gain better insight into the economic conditions and workforce trends, Northern Virginia Community College (NOVA) partnered with Economic Modeling Specialists Intl. (EMSI) to conduct an economic overview of the college's service region and a workforce "gap" analysis of the college's program offerings. Gap analysis is a technique used to assess the supply and demand of skilled workers and identify the educational programs that need to be adapted in order to fill any existing or future gaps. The analysis weighs the educational output of NOVA and other regional institutions against the number of job openings related to the institutions' program offerings to determine whether an oversupply or an undersupply of skilled workers exists. The goal of the analysis is to provide NOVA with relevant data and information that it can use when solving problems and making decisions about current and future program development.

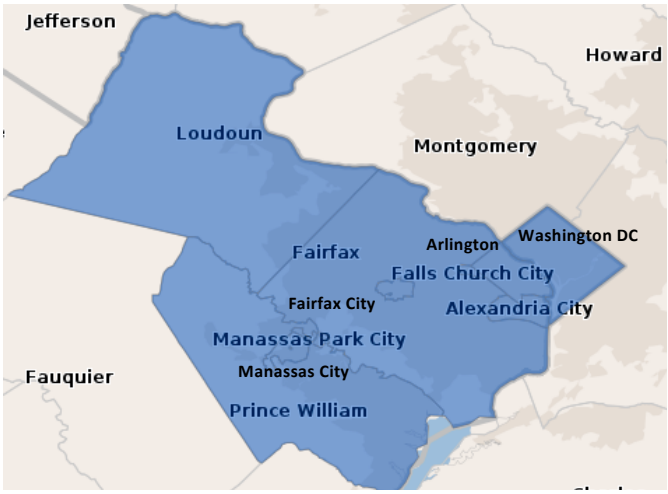
The regional backdrop used in this report is defined by 9 counties in Northern Virginia (Alexandria City, Arlington, Fairfax, Fairfax City, Falls Church City, Loudoun, Manassas City, Manassas Park City, and Prince William) and Washington, DC. This regional backdrop will be referred to as "the NOVA Service Region". See Figure 1.1 for a map of the region.[1] The NOVA Service Region is large with a mixture relatively population dense counties and the extremely population dense area in and around Washington, DC.

The report is broken into two chapters. Chapter 1 provides an overview of employment in the NOVA Service Region economy with high-level information about current and projected job trends, resident commuting patterns, and unemployment. Chapter 1 also provides further information specifically related to the educational characteristics of the population by gender and ethnicity. Chapter 2 summarizes the results of the program gap analysis and provides recommendations for possible future program needs. After a brief conclusion, detailed information and data are provided in the appendices.

1 The industry and occupation data presented in this report reflect the number of jobs by place of work, not by place of residence. However, the report does assess the commuting patterns of residents to determine where they live and work, both within and outside of the region.

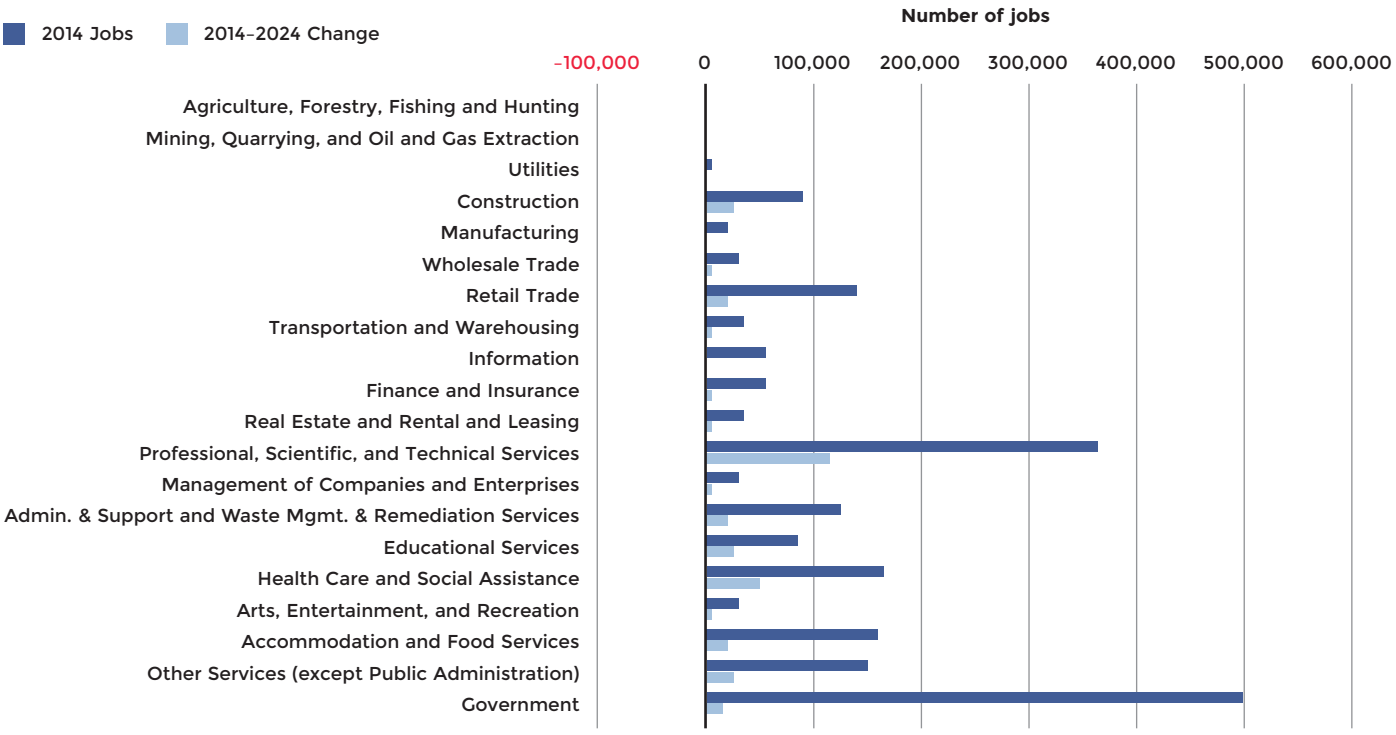
CHAPTER 1:
OVERVIEW OF THE ECONOMY

FIGURE 1.1: MAP OF NOVA SERVICE REGION



This chapter provides a high-level overview of employment and demographics in the economy of the NOVA Service Region, defined by 9 counties in Virginia and Washington, DC (see Figure 1.1). The goal of this chapter is to provide data on the economic and workforce employment trends that either already exist or are developing in the region. Such information is crucial in building awareness of the region's labor force – both now and in the future – and identifying priority areas where educators can focus their attention. The chapter examines employment and demographics in the NOVA Service Region according to the following five indicators: jobs by industry, jobs by occupation, commuting patterns, unemployment, and educational attainment.

FIGURE 1.2: JOBS AND JOB CHANGE BY INDUSTRY SECTOR IN NOVA SERVICE REGION, 2014 TO 2024



Source: EMSI Complete Data 2014.3

JOBS BY INDUSTRY

Evaluating current and future employment by industry provides information on the economic diversification of a given region. Industries consist of groups of companies that are primarily engaged in producing the same product or service. The North American Industry Classification System (NAICS) is the structure used by the U.S. Census Bureau to classify establishments into industries based on their production process (the final product or service is usually similar for the firms in a given industry). NAICS applies a six-digit hierarchical coding system to organize more than 1,100 detailed industries into twenty larger industry sectors. The breakdown of current and future employment by major industry sector in the NOVA Service Region appears in Table 1.1 and Figure 1.2 on the previous page.

As shown, the three largest industry sectors in the NOVA Service Region are Government; Professional, Scientific, & Technical Services; and Health Care & Social Assistance. Together these sectors made up 1,032,251 jobs or 50% of total regional employment in 2014. All three sectors are projected to grow between 2014 and 2024. In fact, the Professional, Scientific, & Technical Services sector is expected to grow by 113,778 jobs. It is unsurprising that the Government sector would be as large as it is in a region containing the federal capital. Other industry sectors with notable projected growth are: Other Services (except Public Administration) (+27,153 jobs), Construction (+26,561 jobs), and Educational Services (+23,537 jobs). The only industry sectors expected to shrink between 2014 and 2024 are: Manufacturing (-1,059 jobs); and Agriculture, Forestry, Fishing, & Hunting (-99 jobs).

TABLE 1.1: CURRENT AND PROJECTED JOBS AND JOB CHANGE BY INDUSTRY SECTOR, 2014 TO 2024

NAICS CODE	DESCRIPTION	2014 JOBS	2024 JOBS	CHANGE	% CHANGE
11	Agriculture, Forestry, Fishing and Hunting	1,046	947	(99)	(9%)
21	Mining, Quarrying, and Oil and Gas Extraction	525	568	43	8%
22	Utilities	4,149	4,202	53	1%
23	Construction	89,083	115,644	26,561	30%
31	Manufacturing	19,604	18,545	(1,059)	(5%)
42	Wholesale Trade	29,650	33,067	3,417	12%
44	Retail Trade	142,430	161,222	18,792	13%
48	Transportation and Warehousing	37,131	42,055	4,924	13%
51	Information	54,081	54,564	483	1%
52	Finance and Insurance	53,577	59,759	6,182	12%
53	Real Estate and Rental and Leasing	35,989	39,148	3,159	9%
54	Professional, Scientific, and Technical Services	366,404	480,182	113,778	31%
55	Management of Companies and Enterprises	30,082	32,637	2,555	8%
56	Administrative and Support and Waste Management and Remediation Services	126,899	147,679	20,780	16%
61	Educational Services	86,116	109,653	23,537	27%
62	Health Care and Social Assistance	166,816	216,805	49,989	30%
71	Arts, Entertainment, and Recreation	29,859	35,142	5,283	18%
72	Accommodation and Food Services	159,357	179,788	20,431	13%
81	Other Services (except Public Administration)	148,254	175,407	27,153	18%
90	Government	499,031	515,527	16,496	3%
	Total	**2,080,084**	**2,422,541**	**342,458**	**16%**

Source: EMSI Complete Data 2014.3

TABLE 1.2: EMPLOYMENT CONCENTRATION BY INDUSTRY SECTOR IN NOVA SERVICE REGION, 2014 & 2024

NAICS CODE	DESCRIPTION	2014 LOCATION QUOTIENT	2024 LOCATION QUOTIENT
11	Agriculture, Forestry, Fishing and Hunting	0.04	0.04
21	Mining, Quarrying, and Oil and Gas Extraction	0.04	0.04
22	Utilities	0.56	0.54
23	Construction	0.83	0.92
31	Manufacturing	0.12	0.11
42	Wholesale Trade	0.36	0.35
44	Retail Trade	0.65	0.65
48	Transportation and Warehousing	0.55	0.53
51	Information	1.42	1.32
52	Finance and Insurance	0.64	0.62
53	Real Estate and Rental and Leasing	1.05	1.03
54	Professional, Scientific, and Technical Services	2.80	2.92
55	Management of Companies and Enterprises	1.03	0.98
56	Administrative and Support and Waste Management and Remediation Services	0.97	0.91
61	Educational Services	1.65	1.67
62	Health Care and Social Assistance	0.65	0.66
71	Arts, Entertainment, and Recreation	0.87	0.87
72	Accommodation and Food Services	0.92	0.88
81	Other Services (except Public Administration)	1.49	1.53
90	Government	1.52	1.43

Source: EMSI Complete Data 2014.3

Table 1.2 shows the employment concentration of the industry sectors in the NOVA Service Region, measured in terms of location quotients (LQs). LQs are used to assess national competitiveness by comparing the concentration of employment in a given industry against the concentration of employment for that same industry across the nation. An LQ equal to 1 means that the percentage of total employment comprised by an industry in the region exactly matches the percentage of total employment comprised by that industry in the nation. An LQ greater than 1 means that the industry comprises a greater proportion of total employment in the region than it does in the nation.

High LQs (usually anything greater than 1.2) are an indication that the region has a comparative advantage or specialization in certain industries relative to the rest of the nation, or potentially to other competing regions. When evaluated jointly with job counts and expected job growth, high LQs give a sense of the industry sectors that have the greatest potential for workforce investment and where regional economic development professionals are likely to be focusing their efforts. This information is of particular importance to educators seeking to engage in larger conversations with other organizations about aligning program offerings with workforce needs.

The following three industry sectors have the highest location quotients in the NOVA Service Region: Professional, Scientific, & Technical Services (2.80); Educational Services (1.65); and Government (1.52). These three sectors plus Information and Other Services (except Public Administration) are above 1.2 in concentration and are considered to have a comparative advantage. Their relative concentrations are expected to undergo some changes over the next decade, but the comparative advantages that existed in 2014 are expected to remain in 2024.[2]

2 Note that because LQs represent regional employment relative to national employment, a decreasing LQ does not necessarily mean decreasing employment, and likewise an increasing LQ does not necessarily mean increasing employment.

JOBS BY OCCUPATION

Researchers often refer to industry data to get a sense of regional economic trends, but in order to better understand the quality of the jobs contained within that region, some knowledge of occupations is needed. This is because the earning levels and education requirements of workers bear more of a relationship to their occupation than to the industry in which they work. For example, the Manufacturing industry – while employing a number of assemblers and machine operators – also employs people in management occupations and in professional occupations such as engineering. All of these occupations have different pay scales and require varying levels of education and training.

Federal agencies use the Standard Occupational Classification (SOC) system to classify workers into occupational categories based on work performed. The 2010 SOC system contains more than 800 detailed occupations organized according to a five-digit hierarchical coding structure. Detailed occupations with similar job duties are further combined to form 23 major groups. Table 1.3 shows the breakdown of employment in the NOVA Service Region by major group, with information on current and projected jobs, job change, average annual openings, and wage rates.

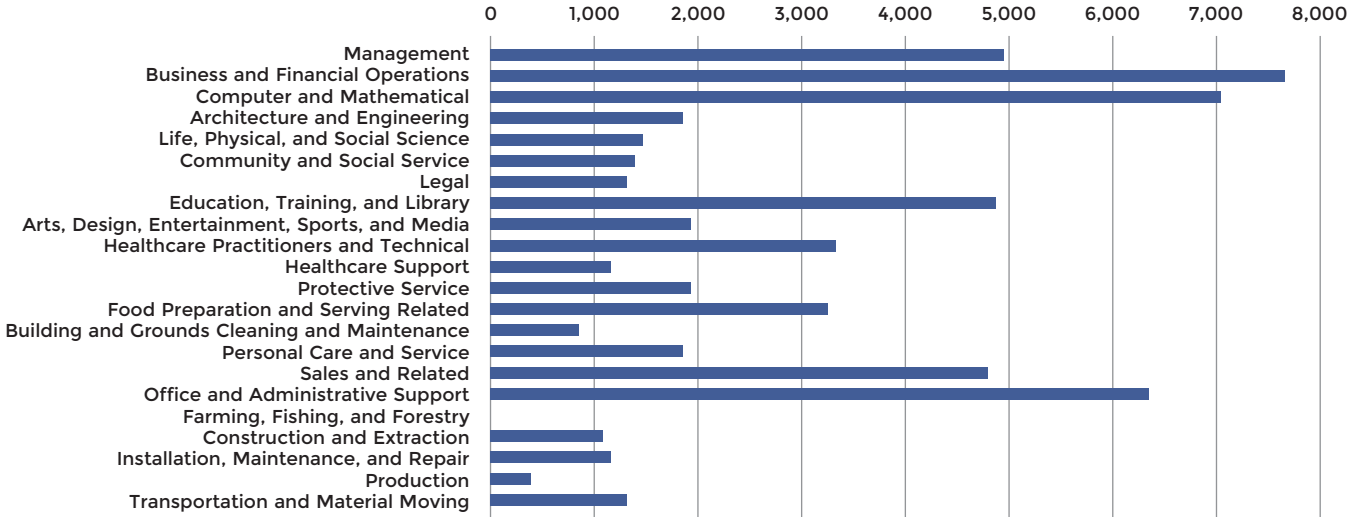
Office & administrative support occupations comprise the largest occupation group in the NOVA Service Region at 261,531 jobs, followed by business & financial operations occupations at 239,995 jobs. Neither of these occupational groups ranks among the highest paid, however. Legal – while one of the smaller occupation groups – has the highest median earnings of $61.13 an hour. Management occupations have median earnings of $60.64 an hour, ranking second highest on the regional pay scale. Several of the higher-paying occupation groups are also projected to

TABLE 1.3: CURRENT AND PROJECTED JOBS, JOB CHANGE, AND MEDIAN HOURLY EARNINGS BY MAJOR OCCUPATION GROUP IN NOVA SERVICE REGION, 2014 TO 2024

SOC CODE	DESCRIPTION	2014 JOBS	2024 JOBS	CHANGE	% CHANGE	AVERAGE ANNUAL OPENINGS	MEDIAN HOURLY EARNINGS
11-0000	Management	164,129	184,493	20,365	12%	4,958	$60.64
13-0000	Business and Financial Operations	239,995	273,047	33,050	14%	7,612	$40.41
15-0000	Computer and Mathematical	162,494	206,775	44,284	27%	7,035	$47.93
17-0000	Architecture and Engineering	45,887	53,137	7,247	16%	1,817	$47.56
19-0000	Life, Physical, and Social Science	35,008	39,832	4,825	14%	1,457	$44.37
21-0000	Community and Social Service	30,971	37,876	6,903	22%	1,355	$24.97
23-0000	Legal	63,636	66,905	3,268	5%	1,336	$61.13
25-0000	Education, Training, and Library	112,427	139,748	27,321	24%	4,873	$27.62
27-0000	Arts, Design, Entertainment, Sports, and Media	57,666	64,891	7,222	13%	1,952	$32.08
29-0000	Healthcare Practitioners and Technical	80,139	96,094	15,954	20%	3,277	$39.95
31-0000	Healthcare Support	35,680	46,635	10,954	31%	1,130	$15.32
33-0000	Protective Service	68,651	78,316	9,663	14%	1,923	$24.90
35-0000	Food Preparation and Serving Related	149,113	170,355	21,240	14%	3,272	$11.49
37-0000	Building and Grounds Cleaning and Maintenance	78,848	92,762	13,915	18%	862	$13.25
39-0000	Personal Care and Service	70,552	87,467	16,915	24%	1,878	$12.81
41-0000	Sales and Related	158,547	180,202	21,651	14%	4,779	$18.37
43-0000	Office and Administrative Support	261,531	296,272	34,739	13%	6,333	$20.97
45-0000	Farming, Fishing, and Forestry	1,305	1,363	58	4%	13	$16.29
47-0000	Construction and Extraction	69,529	87,478	17,925	26%	1,110	$22.27
49-0000	Installation, Maintenance, and Repair	53,330	62,657	9,322	17%	1,166	$25.57
51-0000	Production	30,341	32,931	2,608	9%	408	$19.69
53-0000	Transportation and Material Moving	71,343	82,256	10,911	15%	1,296	$18.71

Source: EMSI Complete Data 2014.3

FIGURE 1.3: AVERAGE ANNUAL OPENINGS BETWEEN 2014 AND 2024 FOR WORKERS WITH SOME COLLEGE AND ABOVE BY OCCUPATION GROUP IN THE NOVA SERVICE REGION



Source: EMSI Complete Data 2014.3

experience lower job growth over the next ten years, such as legal occupations (5%) and management occupations (12%). Computer & mathematical occupations are expected to grow by an above average 27% and ranks third highest on the regional pay scale at $47.93 an hour.

Figure 1.3 provides a look at the average annual job openings for workers with at least some college education by occupational group. Job openings refer to new jobs due to growth plus replacement jobs due to worker turnover. Between 2014 and 2024, the occupations with the highest number of average annual job openings for workers with at least some college education are projected to be: business & financial operations, sales & related, and computer & mathematical.

COMMUTING PATTERNS

The Longitudinal Employer-Household Dynamics (LEHD) program[3] at the U.S. Census Bureau provides information on the residential and employment locations of workers. "Jobs by place of work" refers to where residents of the region commute to work, and "jobs by place of residence" refers to where workers in the region live. Data for the NOVA Service Region appear in Tables 1.4 and 1.5, with

3 LEHD is an innovative program that uses modern statistical and computing techniques to combine federal and state administrative data on employers and employees with core Census Bureau censuses and surveys while protecting the confidentiality of people and firms that provide the data.

TABLE 1.4: JOBS BY PLACE OF WORK

COUNTY	JOBS	COMMUTE SHARE
Fairfax County, VA	410,210	32.5%
District of Columbia, DC	314,440	24.9%
Loudoun County, VA	88,838	7.0%
Arlington County, VA	88,504	7.0%
Prince William County, VA	63,080	5.0%
Alexandria city, VA	62,007	4.9%
Montgomery County, MD	54,704	4.3%
Prince George's County, MD	34,546	2.7%
Fairfax city, VA	16,190	1.3%
Manassas city, VA	12,556	1.0%
All Other Locations	117,562	9.3%

Source: Census LEHD

FIGURE 1.4: JOBS BY PLACE OF WORK IN THE NOVA SERVICE REGION

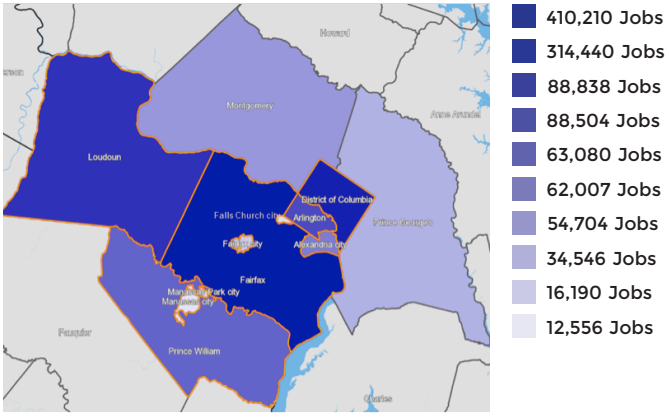


TABLE 1.5: WHERE WORKERS IN THE NOVA SERVICE REGION LIVE

COUNTY	COUNT	COMMUTE SHARE
Fairfax County, VA	416,680	25.5%
District of Columbia, DC	193,750	11.8%
Prince George's County, MD	155,602	9.5%
Prince William County, VA	140,795	8.6%
Loudoun County, VA	133,597	8.2%
Montgomery County, MD	122,496	7.5%
Arlington County, VA	90,783	5.5%
Alexandria city, VA	58,211	3.6%
Stafford County, VA	20,730	1.3%
Charles County, MD	20,564	1.3%
All Other Locations	283,447	17.3%

Source: Census LEHD

FIGURE 1.5: JOBS BY PLACE OF RESIDENCE IN NOVA SERVICE REGION

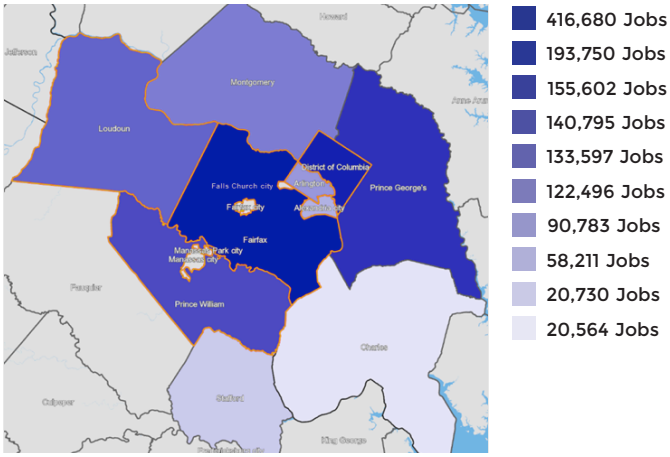
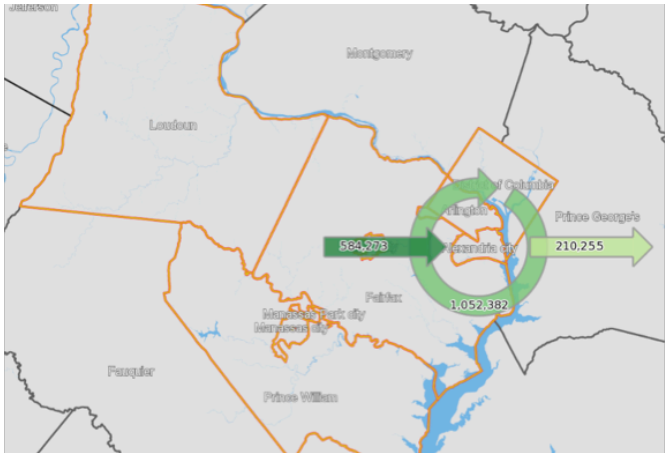


FIGURE 1.6: IN-FLOW/OUT-FLOW JOB COUNT



584,273 – Employed in the Service Region but Living Outside
210,255 – Living in the Service Region but Employed Outside
1,052,382 – Living and Employed in the Service Region

the same information displayed in Figures 1.4 and 1.5.

Approximately 16.7% of residents commute outside the NOVA Service Region for work, indicating that there are economic links between the region and surrounding communities. A significant portion of residents works in Fairfax County, VA (32.5%) or Washington, D.C. (24.9%). Table 1.4 and Figure 1.4 display the top ten places of work for NOVA Service Region residents. The two closest counties in Maryland, Montgomery and Prince George's, have the largest share of the out-commuters.

Table 1.5 and Figure 1.5 display the top ten counties by place of residency. Of the people who work in the NOVA Service Region, 25.5% live Fairfax County, 11.8% live in Washington, D.C., and 9.5% live in Prince George's County (MD). Altogether, 64.3% of the individuals who work in the NOVA Service Region also live within the region.

Figure 1.6 presents the inflow and outflow of jobs to and from the NOVA Service Region. There are 1,636,655 jobs in the region with 1,052,382 of these jobs filled by residents and 584,273 jobs going to people living outside the region. Additionally, 210,255 residents commute outside the region for work. The figure clearly illustrates the fact that more workers in-commute than out-commute.

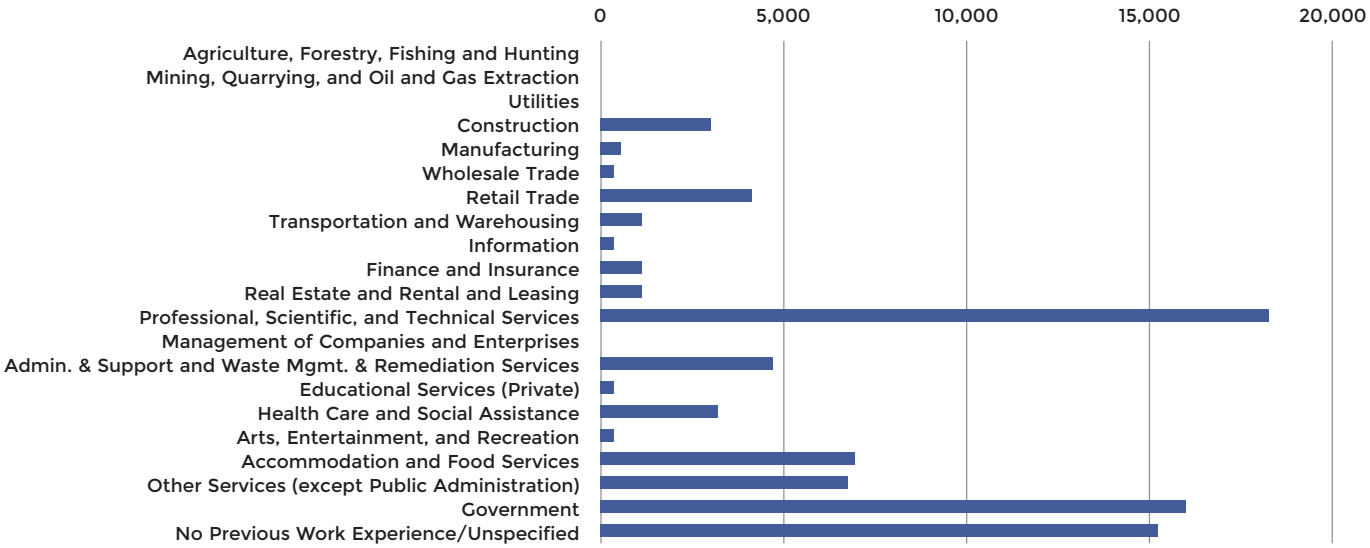
UNEMPLOYMENT

Data on unemployment give researchers an idea of where skills mismatches may exist in the region. Unemployment data can also provide important context when identifying the training programs that are best suited to transitioning unemployed workers into in-demand occupations.

Table 1.6 and Figure 1.7 on the next page present the number of people unemployed by industry sector in the NOVA Service Region. Data are as of May 2014 and follow the same methodology used by the federal statistical agencies to determine the number of workers in an industry that are not currently employed. The unemployment rate is not provided because it is difficult to accurately determine the size of the labor force in a given industry on a monthly basis. Rather than the unemployment rate, the percent of all unemployed for the region and for the nation are provided in order to display which industry sectors have the highest concentration of unemployed workers.

Four industry sectors in the NOVA Service Region exceed the national concentration of unemployed workers. The other 17 industrial sectors in the region are either at or below national levels.

FIGURE 1.7: NUMBER OF UNEMPLOYED WORKERS BY INDUSTRY SECTOR IN NOVA SERVICE REGION



Source: EMSI Total Unemployment (5/2014)

TABLE 1.6: NUMBER OF UNEMPLOYED WORKERS BY INDUSTRY SECTOR IN NOVA SERVICE REGION

NAICS CODE	DESCRIPTION	NO. OF UNEMPLOYED	% OF UNEMPLOYED	NATIONAL % OF UNEMPLOYED
11	Agriculture, Forestry, Fishing and Hunting	5	0%	1%
21	Mining, Quarrying, and Oil and Gas Extraction	48	0%	1%
22	Utilities	12	0%	0%
23	Construction	3,117	4%	8%
31	Manufacturing	650	1%	9%
42	Wholesale Trade	299	0%	2%
44	Retail Trade	4,209	5%	12%
48	Transportation and Warehousing	1,160	1%	3%
51	Information	438	1%	2%
52	Finance and Insurance	1,136	1%	3%
53	Real Estate and Rental and Leasing	1,045	1%	1%
54	Professional, Scientific, and Technical Services	18,412	22%	4%
55	Management of Companies and Enterprises	29	0%	0%
56	Administrative and Support and Waste Management and Remediation Services	4,655	6%	8%
61	Educational Services (Private)	340	0%	2%
62	Health Care and Social Assistance	3,239	4%	7%
71	Arts, Entertainment, and Recreation	310	0%	2%
72	Accommodation and Food Services	6,947	8%	9%
81	Other Services (except Public Administration)	6,841	8%	4%
90	Government	16,187	19%	7%
99	No Previous Work Experience/Unspecified	15,354	18%	15%

Source: EMSI Total Unemployment (5/2014)

As shown in the table, the category with the highest number of unemployed is the Professional, Scientific, & Technical Services sector. The second highest number of unemployed workers is Government. The third highest number of unemployed workers is in a non-industry labeled as "No Previous Work Experience/Unspecified." This is simply a catch-all category for which reliable unemployment data are unavailable. For industry sectors such as Construction, seasonal jobs or jobs of short duration may also lead to high numbers of unemployed workers. It is also common for an industry like Retail Trade to have a high percentage of low-skill jobs that require little to no education and training, thus making them more vulnerable to worker turnover. Other sectors that are generally affected by high turnover include Accommodation & Food Services and Administrative & Support & Waste Management & Remediation Services.

Table 1.7 and Figure 1.8 on the next page provide a breakdown of unemployment in the NOVA Service Region by major occupation group. As shown, occupation groups that contain the highest number of unemployed workers are office & administrative support occupations (13,120 unemployed workers), no previous work experience/unspecified (9,489 unemployed workers), and management (7,566 unemployed workers). Though some of these occupational groups have a relatively high number of annual openings (see Figure 1.3), high turnover still leads to a high number of unemployed.

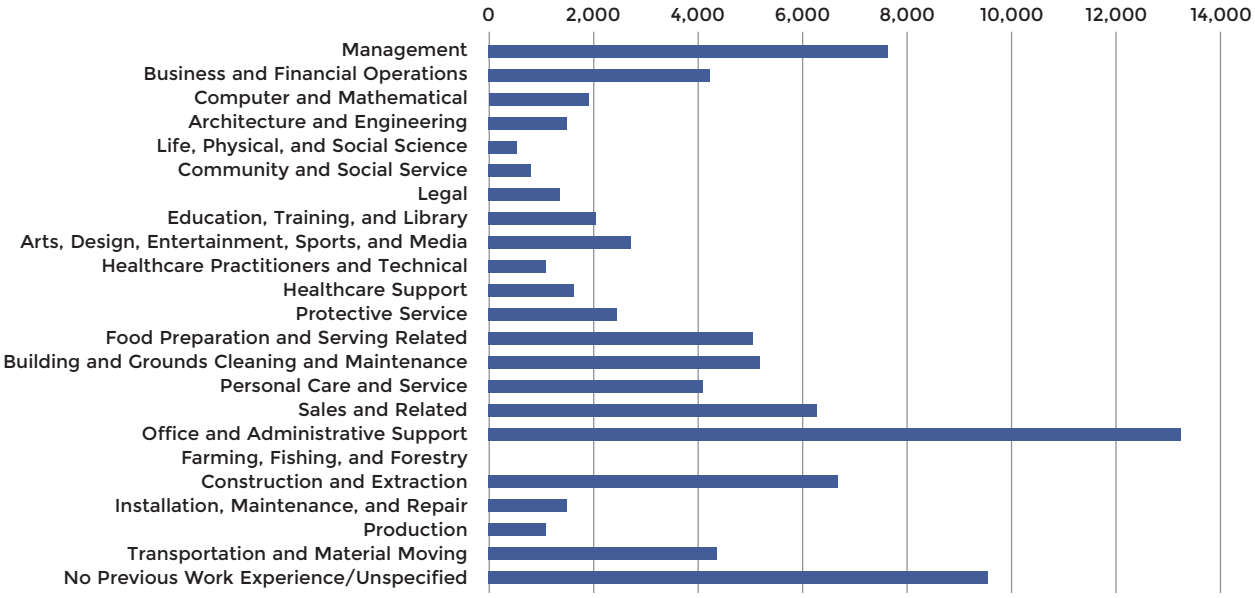
A number of occupational groups have a concentration of unemployed workers that is clearly below the national average, including production occupations, sales & related occupations, and transportation & materials moving occupations. Management occupations and business & financial operations occupations both have a higher concentration of unemployed than at the national level. These occupation groups generally require more education and training than low-skill groups such as food preparation & serving related occupations.

TABLE 1.7: NUMBER OF UNEMPLOYED WORKERS BY OCCUPATION GROUP IN NOVA SERVICE REGION

SOC CODE	DESCRIPTION	NO. OF UNEMPLOYED	% OF UNEMPLOYED	NATIONAL % OF UNEMPLOYED
11-0000	Management	7,566	9%	5%
13-0000	Business and Financial Operations	4,131	5%	3%
15-0000	Computer and Mathematical	1,917	2%	1%
17-0000	Architecture and Engineering	1,497	2%	1%
19-0000	Life, Physical, and Social Science	606	1%	0%
21-0000	Community and Social Service	804	1%	1%
23-0000	Legal	1,388	2%	1%
25-0000	Education, Training, and Library	2,035	2%	2%
27-0000	Arts, Design, Entertainment, Sports, and Media	2,760	3%	2%
29-0000	Healthcare Practitioners and Technical	1,141	1%	2%
31-0000	Healthcare Support	1,579	2%	2%
33-0000	Protective Service	2,437	3%	1%
35-0000	Food Preparation and Serving Related	5,048	6%	8%
37-0000	Building and Grounds Cleaning and Maintenance	5,066	6%	5%
39-0000	Personal Care and Service	3,992	5%	3%
41-0000	Sales and Related	6,192	7%	11%
43-0000	Office and Administrative Support	13,120	16%	14%
45-0000	Farming, Fishing, and Forestry	48	0%	1%
47-0000	Construction and Extraction	6,679	8%	8%
49-0000	Installation, Maintenance, and Repair	1,479	2%	2%
51-0000	Production	1,081	1%	6%
53-0000	Transportation and Material Moving	4,381	5%	8%
99-0000	No Previous Work Experience/Unspecified	9,489	11%	11%

Source: EMSI Total Unemployment (5/2014)

FIGURE 1.8: NUMBER OF UNEMPLOYED WORKERS BY OCCUPATION GROUP IN NOVA SERVICE REGION



Source: EMSI Total Unemployment (5/2014)

EDUCATIONAL ATTAINMENT

This section describes the educational attainment of the population in the NOVA Service Region for adults aged 25 years and older. This information is useful for educators targeting specific population groups that have low education levels. Educational attainment data in this section is presented by gender and by ethnicity and is broken out according to the following categories: 1) less than a high school degree, 2) high school degree, 3) some college,[4] 4) associate's degree, 5) bachelor's degree, and 6) graduate degree and higher.

Overall Educational Attainment

Table 1.8 on the following page and Figure 1.9 display the educational attainment of the overall adult population in the NOVA Service Region, without reference to gender and ethnicity. In the NOVA Service Region, the percentage of the adult population with a high school diploma or less is 26%, much lower than the national average of 44%. These data suggest there is still an important, if smaller, opportunity for educators in the NOVA Service Region to boost the percentage of adults with an associate's degree or higher (currently this percentage sits at 58% for the

4 The "some college" category includes individuals who attended college but did not successfully obtain a degree and individuals who have received a postsecondary vocational award or professional certification but did not receive an associate's or bachelor's degree.

FIGURE 1.9: EDUCATIONAL ATTAINMENT OF ADULT POPULATION IN THE CFCC ECONOMIC REGION

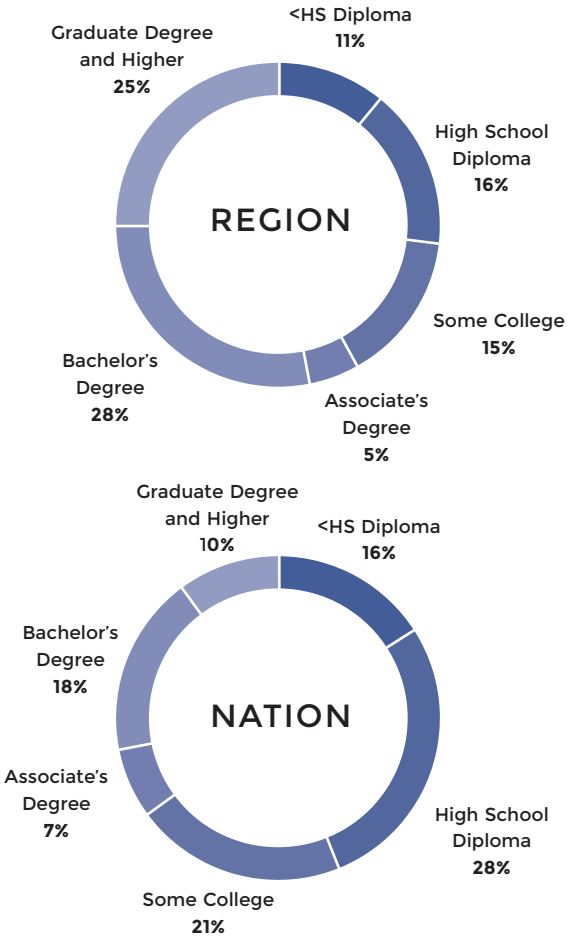


TABLE 1.8: BREAKDOWN OF ADULT POPULATION IN NOVA SERVICE REGION BY EDUCATIONAL ATTAINMENT, 2009 AND 2014

EDUCATION LEVEL	2009 POPULATION	2009 % DISTRIBUTION	2014 POPULATION	2014 % DISTRIBUTION	POPULATION CHANGE	% DISTRIBUTION CHANGE
Less than HS diploma	182,946	10%	221,969	11%	39,022	0.8%
High school diploma	299,483	16%	330,047	16%	30,564	(0.3%)
Some college	288,462	15%	321,733	15%	33,271	(0.1%)
Associate's degree	89,278	5%	100,354	5%	11,076	0.0%
Bachelor's degree	530,990	28%	589,629	28%	58,639	(0.2%)
Graduate degree or higher	483,241	26%	534,818	25%	51,577	(0.3%)

Source: EMSI Complete Data 2014.3

TABLE 1.9: BREAKDOWN OF ADULT POPULATION IN NOVA SERVICE REGION BY EDUCATIONAL ATTAINMENT AND GENDER

EDUCATION LEVEL	MALES	PROPORTION	FEMALES	PROPORTION
Less than high school diploma	109,074	11%	112,894	10%
High school diploma	152,241	15%	177,806	16%
Some college	145,523	14%	176,210	16%
Associate's degree	42,370	4%	57,984	5%
Bachelor's degree	278,819	28%	310,809	29%
Graduate degree and higher	285,478	28%	249,340	23%

Source: EMSI Complete Data 2014.3

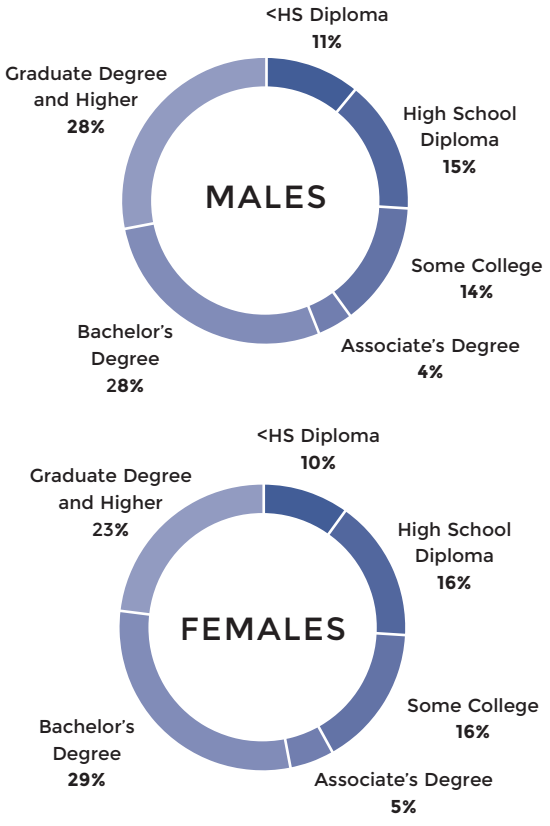
region overall). Out of all the education categories in Table 1.8, the people that are most likely to seek education and training from NOVA are those in the "Less than high school diploma," "High school diploma," and "Some college" categories. Together these categories make up 873,749 people, or 42% of the entire adult population in the region.

Between 2009 and 2014, the proportion of the overall adult population with "Less than a high school diploma" increased by 0.8 percentage points.[5] Meanwhile, the proportion of the adult population with a "High school diploma" and higher levels of education decreased marginally.

Educational Attainment by Gender

The distribution of educational attainment by gender is relatively even in the NOVA Service Region. There are minor differences in that females have a slightly proportionally larger presence in the middle of the educational distribution. In the "Bachelor's degree," "Associate's degree," "Some college," and "High school diploma" categories the proportion for females is 67% compared to only 61% for

FIGURE 1.10: EDUCATIONAL ATTAINMENT OF ADULT POPULATION IN NOVA SERVICE REGION BY GENDER



5 The column labeled "% Change" in Table 8 refers to the proportional change, not to the percent change between 2009 and 2014. For example, if a category comprised 20% of the total adult population in 2009 and 25% of the total adult population in 2014, the proportional change is equal to the difference between the two values (in this example, 5%).

males. Males are more likely to have "Less than high school diploma" or "Graduate degree and higher." This information appears in Table 1.9 and Figure 1.10 on the previous page.

Educational Attainment by Ethnicity

Figure 1.11 and Table 1.10 display the educational attainment of the adult population by ethnicity. The "White, Non-Hispanic" ethnicity category has the highest percentage of adults with post-secondary degrees (72%), followed by the "Asian, Non-Hispanics" category (66%) and "Two or More Races, Non-Hispanics category (55%). The "Hispanic, All Types" category has the lowest levels of education attainment. For "Hispanic, All Types," only 30% of the adult population has a post-secondary degree and 56% has a high school diploma or less. While the region is largely "White, Non-Hispanic," there are opportunities to increase educational attainment in other sizable ethnic groups as well.

FIGURE 1.11: EDUCATIONAL ATTAINMENT OF ADULT POPULATION IN NOVA SERVICE REGION BY ETHNICITY

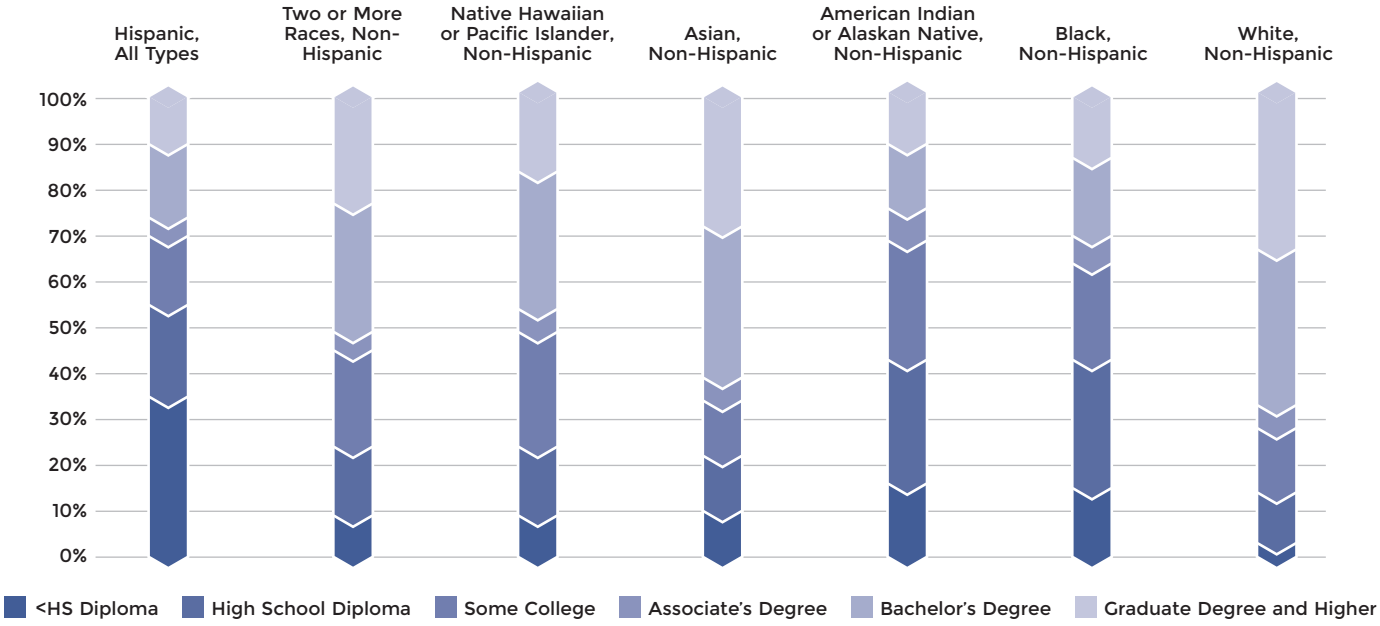


TABLE 1.10: BREAKDOWN OF ADULT POPULATION IN NOVA SERVICE REGION BY EDUCATIONAL ATTAINMENT AND ETHNICITY

		< HS DIPLOMA	HIGH SCHOOL DIPLOMA	SOME COLLEGE	ASSOCIATE'S DEGREE	BACHELOR'S DEGREE	GRADUATE DEGREE AND HIGHER
White, Non-Hispanic	COUNT	29,306	122,075	155,463	50,965	381,000	373,875
	PERCENT	3%	11%	14%	5%	34%	34%
Black, Non-Hispanic	COUNT	59,381	108,828	83,773	22,079	66,377	49,883
	PERCENT	15%	28%	21%	6%	17%	13%
American Indian or Alaskan Native, Non-Hispanic	COUNT	646	1,119	1,047	275	578	434
	PERCENT	16%	27%	26%	7%	14%	11%
Asian, Non-Hispanic	COUNT	26,604	32,649	30,335	13,098	85,074	73,712
	PERCENT	10%	12%	12%	5%	33%	28%
Native Hawaiian or Pacific Islander, Non-Hispanic	COUNT	130	230	379	70	454	264
	PERCENT	9%	15%	25%	5%	30%	17%
Two or More Races, Non-Hispanic	COUNT	3,325	5,748	7,952	1,462	10,744	8,710
	PERCENT	9%	15%	21%	4%	28%	23%
Hispanic, All Types	COUNT	102,576	59,398	42,784	12,405	45,402	27,940
	PERCENT	35%	20%	15%	4%	16%	10%

Source: EMSI Complete Data 2014.3

CHAPTER 2:
PROGRAM GAP ANALYSIS

The results that appear in this chapter present a focused view of the program groups projected to have a regional gap or surplus. Programs are analyzed at two different levels: postsecondary vocational certifications and associate's degrees, according to the training level offered at NOVA.

Each table includes the CIP code and title, the average annual openings associated with that program (which have been de-duplicated using the process outlined in Appendix 3), the average annual completers between 2011 and 2013, and finally the gap or surplus figure. If the numbers are positive, there is a shortage or "gap" of completers—i.e. there are more job openings in those occupations than there are graduates or completers. If the numbers are negative, then there are fewer annual job openings compared to the "surplus" of completers for those program groups.

INTERPRETING GAP/SURPLUS ANALYSIS RESULTS

The gap analysis is intended to serve as a point of departure for NOVA as the college discusses regional workforce needs. A surplus or deficit of workers in a particular category does not necessarily indicate a problem for the region, and it is important that each occupation group be evaluated on a case-by-case basis. Evaluation of the program supply (surplus and gaps) will provide an understanding of the role skilled occupations play in economic sustainability and growth.

Other information should also be considered when evaluating these surpluses and gaps. For example, only the education supply pipeline is considered in this analysis because these numbers can be tracked at the county and school level. However, other sources of supply exist as well—unemployed workers, industry trained pipelines, in-migrators, and job changers from other occupational categories can also be a source of skilled occupations. These types of considerations are useful when evaluating specific types of occupations. Unfortunately, secondary data sources (e.g., regional, state, and federal data) do not account for this, and primary data collection methods (i.e., interviews and surveys) are among the only ways to obtain information on this type of supply pipeline.

Lastly, it is important to keep in mind that the labor market is not so simple and efficient that one should expect supply and demand to be at perfect equilibrium for any extended period of time. As such, as a general rule of thumb, only programs with considerable gaps or surpluses should be considered long-term strategic issues worthy of closer examination. Given the size and characteristics of the NOVA Service Region, any gap or surplus within 25 jobs either above or below zero should be considered within the normal range of labor market fluctuations.

Once evaluated internally within the college, specific implications should be considered for programs with substantial surpluses or gaps. These implications include:

- **Surplus:** Oversupply of specific education completers may lead to higher attrition rates (i.e., brain drain). In other words, the region is educating a workforce that is leaving after program completion because of a lack of jobs. Note: In the analysis of the NOVA Service Region where the neighboring population density is very high, a surplus of completers may indicate the need for service region residents to commute outside of the service region to find job opportunities. The commuting pattern flows described in Chapter 1 suggest that this is possible.
- **Gap:** Undersupply of specific program completers may lead to missed opportunities for economic growth and put stress on local businesses to find necessary human capital elsewhere. In other words, the region's education institutions are not providing the necessary workforce for the region and thereby shifting the burden on the industries to find workers in other economies to fill the needed occupations. This translates into higher human resources costs and decreased efficiencies in the economic system. This also provides an opportu-

nity for institutions to develop new programs. Note: Given high population density in the region adjacent to the service region, a completion gap may be filled by other institutions near the service region. This potential scenario will need to be taken into consideration from the leadership.

POSTSECONDARY CERTIFICATE LEVEL GAP ANALYSIS

Figure 2.1 provides a graphical illustration that summarizes the top 10 gaps for NOVA postsecondary certificate level programs.

Table 2.1 on the next page lists supply and demand for all certificate program types for which NOVA offers a training program. While other program groups in the region may face larger surpluses, NOVA did not offer any of the programs. At the certificate level, about 38% of the completers in the region will be from NOVA.

There are 14 programs training for associated occupations with an undersupply of workers. As shown in Table 2.1, General Construction Trades face the largest gap: there are 1,807 annual openings, compared to five completers from NOVA. For this program, NOVA was the only institution to have at least one completion in the region over the past three years. A similar situation is also occurring with General Cooking & Related Culinary Arts, with only nine annual completers for 1,470 projected job openings. The program with the next largest gap is Child Care Provider/Assistant (gap of 625). It is important to keep perspective when reviewing the gap analysis. In the instance of the Child Care Provider/Assistant, there may be a large gap, but because the wages of occupations associated with this program are often lower ($10.79 an hour), expanding the program may not be warranted.

There are only three certificate level programs at NOVA that are training for occupations with a surplus of workers. Clinical/Medical Laboratory Technician has the highest surplus among programs offered at the certificate level by NOVA at 132. Regionally, there are 29 average annual openings to 161 average annual completers. NOVA is only responsible for 17 annual completers, but due to the additional supply from other institutions in the region, the surplus exists. Massage Therapy/Therapeutic Massage (surplus of 130) is another other program with a surplus. Once again, NOVA produces a relatively small number of completers (19) but total regional supply (172) exceeds annual openings (42). The final gap is for Other Business Administration, Management & Operations (surplus of 72). It is possible that some of these completers are either migrating outside the immediate region upon completion, or staying, but commuting to jobs outside the NOVA Service Region.

FIGURE 2.1: SUPPLY AND DEMAND FOR NOVA POSTSECONDARY CERTIFICATE LEVEL PROGRAMS

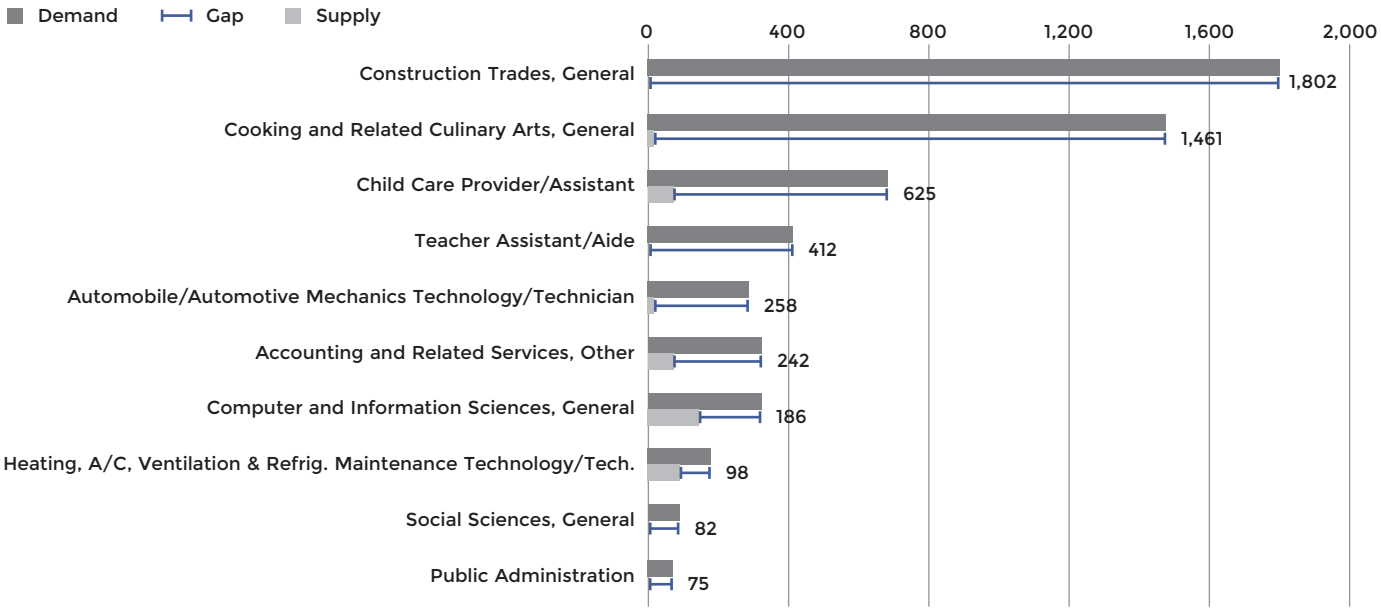


TABLE 2.1: SUPPLY AND DEMAND FOR NOVA CERTIFICATE LEVEL PROGRAMS

CIP CODE	CIP TITLE	AVERAGE ANNUAL OPENINGS	AVERAGE ANNUAL COMPLETERS	NOVA CERTIFICATE COMPLETERS	TOTAL GAP OR SURPLUS	MEDIAN HOURLY WAGE*
46.000	Construction Trades, General	1,807	5	5	1,802	$24.66
12.050	Cooking and Related Culinary Arts, General	1,470	9	9	1,461	$13.61
19.0709	Child Care Provider/Assistant	690	65	65	625	$10.79
13.1501	Teacher Assistant/Aide	420	8	8	412	$13.91
47.0604	Automobile/Automotive Mechanics Technology/ Technician	283	25	25	258	$22.85
52.0399	Accounting and Related Services, Other	319	77	77	242	$22.88
11.0101	Computer and Information Sciences, General	325	139	32	186	$52.53
47.0201	Heating, Air Conditioning, Ventilation and Refrigeration Maintenance Technology/Technician	182	83	34	98	$26.65
45.0101	Social Sciences, General	84	2	2	82	$32.08
44.0401	Public Administration	75	0	0	75	$62.84
47.0605	Diesel Mechanics Technology/Technician	56	2	2	54	$23.45
51.0904	Emergency Medical Technology/Technician (EMT Paramedic)	76	23	23	53	$25.12
48.0508	Welding Technology/Welder	59	6	6	52	$21.99
52.0901	Hospitality Administration/Management, General	50	13	13	38	$26.45
23.1303	Professional, Technical, Business, and Scientific Writing	26	3	3	23	$35.21
50.0401	Design and Visual Communications, General	26	5	5	21	$29.52
50.0101	Visual and Performing Arts, General	22	6	6	16	$24.77
51.0911	Radiologic Technology/Science - Radiographer	16	1	1	15	$33.71
51.0707	Health Information/Medical Records Technology/ Technician	29	18	18	11	$22.24
51.0999	Allied Health Diagnostic, Intervention, and Treatment Professions, Other	11	1	1	10	$30.90
10.0299	Audiovisual Communications Technologies/Technicians, Other	14	5	5	9	$34.34
41.0101	Biology Technician/Biotechnology Laboratory Technician	10	2	2	9	$22.79
52.0903	Tourism & Travel Services Management	9	7	7	2	$57.42
52.0499	Business Operations Support and Secretarial Services, Other	2	1	1	1	$17.80
15.0201	Civil Engineering Technology/Technician	1	0	0	0	$25.48
43.0106	Forensic Science and Technology	8	12	11	(4)	$34.14
15.1303	Architectural Drafting and Architectural CAD/CADD	2	8	8	(6)	$25.83
31.0301	Parks, Recreation and Leisure Facilities Management, General	4	10	10	(6)	$13.85
51.1501	Substance Abuse/Addiction Counseling	6	12	12	(6)	$22.08
11.0801	Web Page, Digital/Multimedia and Information Resources Design	17	25	21	(7)	$46.07
14.3801	Surveying Engineering	0	9	9	(9)	$64.62
15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	35	44	44	(9)	$35.13
15.1302	CAD/CADD Drafting and/or Design Technology/ Technician	9	19	19	(10)	$25.83
16.1603	Sign Language Interpretation and Translation	4	19	19	(15)	$32.29
43.0103	Criminal Justice/Law Enforcement Administration	16	36	36	(20)	$51.36
52.0299	Business Administration, Management and Operations, Other	39	111	111	(72)	$49.09
51.3501	Massage Therapy/Therapeutic Massage	42	172	19	(130)	$18.77

* *Median Hourly Wage is not completion level specific.*

Source: EMSI Gap Analysis Model. Numbers may not sum due to rounding.

ASSOCIATE'S LEVEL GAP ANALYSIS

Figure 2.2 below provides a graphical illustration of the top gaps for NOVA associate's degree level programs.

Similar to the previous table, Table 2.2 on the next page displays supply and demand for all associate's level programs for which NOVA provides training. There are 15 significant gaps for associate's level programs. Again, the table only includes program groups available at NOVA. Other program groups in the region may face larger gaps, but NOVA does not offer the program. Table 2.3 addresses programs that are not currently being offered but which would address considerable regional workforce gaps. NOVA is not the only institution offering associate's degree level programs in the region, but they do supply 71% of the associate's degrees for the region.

General Construction Trades has the largest associate's degree level program gap (1,918). There are 1,929 average annual openings in the region, compared to 11 average completers (all from NOVA). The next largest is General Business Administration & Management, a field with 1,804 projected annual openings, compared with only 952 completers a year from NOVA and 93 other completers. Child Care Provider/Assistant has the third largest gap with 716 annual openings and only 49 total completers.

There are nine associate's level programs at NOVA that are training for occupations with a surplus of workers. General Social Sciences is the largest surplus with 530 completers for only 109 annual openings. Biological & Physical Sciences (surplus of 317) and Criminal Justice/Law Enforcement Administration (surplus of 161) round out the top three largest surpluses. The other two surpluses are in Clinical/Medical Laboratory Technician (149) and General Engineering (119).

TRANSFER TRACK (LIBERAL ARTS) STUDENTS

A large number students attend NOVA with the intention of transferring to a four-year school to receive a bachelor's degree. Some of these students complete degrees in general studies. Over the past three years, an average of 1,863 students a year have completed General Studies degrees or a Humanities/Humanistic Studies at the associate's degree level, which composes 14% of the college's annual production of certificates and degrees. These students programs do not map with any occupations Another 1,411 have completed a Liberal Arts or Humanities/Humanistic Studies certificate.

Once these students and other transfer students leave NOVA, their educational and career track is difficult to predict. They could attend a four-year college in the region or outside the region, and they could study any number

FIGURE 2.1: SUPPLY AND DEMAND FOR NOVA POSTSECONDARY CERTIFICATE LEVEL PROGRAMS

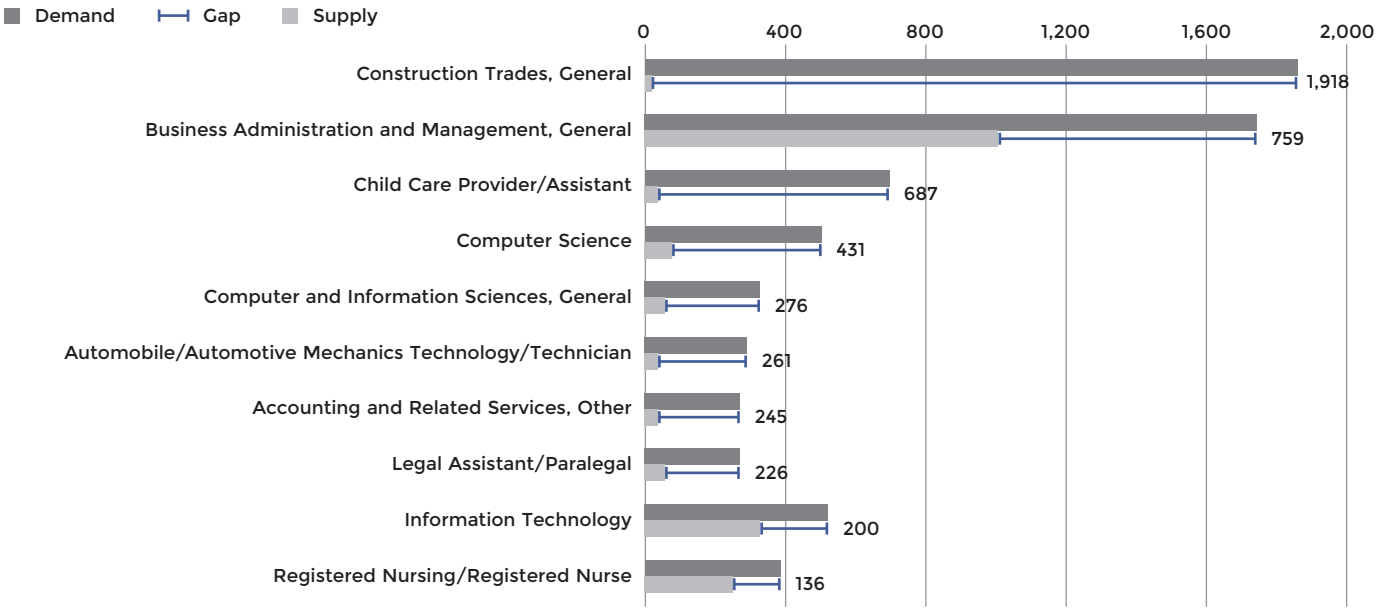


TABLE 2.2: SUPPLY AND DEMAND FOR NOVA ASSOCIATE'S LEVEL PROGRAMS

CIP CODE	CIP TITLE	AVERAGE ANNUAL OPENINGS	AVERAGE ANNUAL COMPLETERS	NOVA ASSOCIATE'S COMPLETERS	TOTAL GAP OR SURPLUS	MEDIAN HOURLY WAGE
46.0000	Construction Trades, General	1,929	11	11	1,918	$24.66
52.0201	Business Administration and Management, General	1,804	1,045	952	759	$52.74
19.0709	Child Care Provider/Assistant	716	49	49	667	$10.79
11.0701	Computer Science	515	83	73	431	$49.29
11.0101	Computer and Information Sciences, General	330	53	53	276	$52.53
47.0604	Automobile/Automotive Mechanics Technology/ Technician	295	34	34	261	$22.85
52.0399	Accounting and Related Services, Other	286	41	39	245	$22.88
22.0302	Legal Assistant/Paralegal	278	52	39	226	$37.68
11.0103	Information Technology	535	335	320	200	$51.72
51.3801	Registered Nursing/Registered Nurse	394	258	208	136	$36.57
15.0000	Engineering Technology, General	119	12	12	107	$31.32
47.0201	Heating, Air Conditioning, Ventilation and Refrigeration Maintenance Technology/Technician	127	26	26	101	$26.65
43.0203	Fire Science/Fire-fighting	107	7	6	100	$27.84
51.0602	Dental Hygiene/Hygienist	92	33	33	60	$47.43
51.0904	Emergency Medical Technology/Technician (EMT Paramedic)	75	30	30	45	$25.12
51.0806	Physical Therapy Technician/Assistant	49	29	29	20	$20.17
52.0901	Hospitality Administration/Management, General	45	28	28	17	$26.45
1.0601	Applied Horticulture/Horticulture Operations, General	22	6	6	16	$16.49
51.0808	Veterinary/Animal Health Technology/Technician and Veterinary Assistant	58	43	41	15	$17.21
50.0408	Interior Design	27	19	19	8	$27.28
41.0101	Biology Technician/Biotechnology Laboratory Technician	11	4	4	7	$22.79
51.0908	Respiratory Care Therapy/Therapist	25	23	18	2	$30.81
51.0910	Diagnostic Medical Sonography/Sonographer and Ultrasound Technician	12	10	10	2	$36.69
51.1599	Mental and Social Health Services and Allied Professions, Other	1	0	0	1	$19.73
52.0903	Tourism and Travel Services Management	4	3	3	1	$57.42
51.0707	Health Information/Medical Records Technology/ Technician	18	22	22	(4)	$22.24
16.1603	Sign Language Interpretation and Translation	1	9	9	(7)	$32.29
51.0911	Radiologic Technology/Science - Radiographer	39	46	35	(7)	$33.71
50.9999	Visual and Performing Arts, Other	6	15	15	(9)	$26.43
4.0901	Architectural Technology/Technician	5	18	18	(14)	$25.83
50.0605	Photography	0	17	13	(16)	$17.69
50.0401	Design and Visual Communications, General	32	69	37	(36)	$29.52
50.0101	Visual and Performing Arts, General	21	69	69	(47)	$24.77
15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	13	72	4	(59)	$35.13
52.0299	Business Administration, Management and Operations, Other	6	66	62	(60)	$49.09
14.0101	Engineering, General	9	128	128	(119)	$64.62
51.1004	Clinical/Medical Laboratory Technician	16	166	14	(149)	$21.34
43.0103	Criminal Justice/Law Enforcement Administration	5	166	83	(161)	$51.36
30.0101	Biological and Physical Sciences	1	318	318	(317)	$62.55
45.0101	Social Sciences, General	109	530	530	(421)	$32.08

Source: EMSI Gap Analysis Model. Numbers may not sum due to rounding.

of different programs that will ultimately determine their future career. What can be shown is that over the next 10 years, jobs that require a bachelor's degree are projected to be in high demand. In any given year between 2014 and 2024, 28,072 jobs in the NOVA service region will require a bachelor's degree and 75,659 will require a bachelor's degree or less, availing these students of a potential choice of 85% of all regional job openings.

POTENTIAL NEW PROGRAMS

In addition to knowing how well NOVA's current educational programs are serving the local labor market, it is helpful to know the fields of opportunity where the college could create new program offerings. Table 2.3 contains a short list of 30 programmatic areas of opportunity that could fill gaps in the labor market by postsecondary voca-

TABLE 2.3: PROGRAMMATIC AREAS OF OPPORTUNITY

SOC	SOC TITLE	AVERAGE ANNUAL OPENINGS	AVERAGE ANNUAL COMPLETERS	GAP	MEDIAN HOURLY EARNINGS	EDUCATION LEVEL
53-3032	Heavy and Tractor-Trailer Truck Drivers	277	0	277	$18.81	Certificate
29-2061	Licensed Practical and Licensed Vocational Nurses	237	40	197	$24.02	Certificate
31-9091	Dental Assistants	184	25	158	$18.91	Certificate
29-2041	Emergency Medical Technicians and Paramedics	73	22	51	$25.54	Certificate
51-1011	First-Line Supervisors of Production and Operating Workers	38	0	38	$30.77	Certificate
49-2011	Computer, Automated Teller, and Office Machine Repairers	31	0	31	$20.83	Certificate
29-2071	Medical Records and Health Information Technicians	56	27	30	$22.24	Certificate
29-2055	Surgical Technologists	29	0	29	$23.19	Certificate
27-4011	Audio and Video Equipment Technicians	21	0	21	$22.77	Certificate
31-9097	Phlebotomists	32	12	20	$17.19	Certificate
33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	17	0	17	$44.38	Certificate
31-9094	Medical Transcriptionists	16	0	16	$19.00	Certificate
49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment	13	0	13	$34.03	Certificate
49-2095	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	10	0	10	$36.36	Certificate
29-2057	Ophthalmic Medical Technicians	10	0	10	$19.03	Certificate
51-5111	Prepress Technicians and Workers	8	0	8	$32.30	Certificate
29-2053	Psychiatric Technicians	7	0	7	$16.18	Certificate
25-2011	Preschool Teachers, Except Special Education	193	3	190	$15.56	Associate
29-2021	Dental Hygienists	94	33	61	$47.43	Associate
53-2021	Air Traffic Controllers	54	0	54	$74.80	Associate
19-4091	Environmental Science and Protection Technicians, Including Health	31	0	31	$16.61	Associate
19-4099	Life, Physical, and Social Science Technicians, All Other	23	0	23	$27.30	Associate
31-2011	Occupational Therapy Assistants	22	0	22	$25.95	Associate
29-2031	Cardiovascular Technologists and Technicians	18	0	18	$33.75	Associate
29-2032	Diagnostic Medical Sonographers	23	10	13	$36.69	Associate
17-3013	Mechanical Drafters	12	0	12	$28.10	Associate
31-2021	Physical Therapist Assistants	27	16	11	$26.66	Associate
49-9062	Medical Equipment Repairers	11	0	11	$25.43	Associate
19-4093	Forest and Conservation Technicians	9	0	9	$20.02	Associate
19-4031	Chemical Technicians	9	0	9	$22.30	Associate

Source: EMSI Gap Analysis Model

TABLE 2.4: SUPPLY AND DEMAND FOR BACHELOR'S LEVEL PROGRAMS

CIP CODE	CIP TITLE	AVERAGE ANNUAL OPENINGS	AVERAGE ANNUAL COMPLETERS	TOTAL GAP OR SURPLUS	MEDIAN HOURLY WAGE
46	Construction Trades, General	2,018	-	2,018	$24.66
11.0701	Computer Science	1,137	84	1,053	$49.29
52.0201	Business Administration and Management, General	2,279	1,239	1,040	$52.74
11.0103	Information Technology	1,326	309	1,017	$51.72
19.0709	Child Care Provider/Assistant	851	-	851	$10.79
11.0101	Computer and Information Sciences, General	929	85	843	$52.53
22.0302	Legal Assistant/Paralegal	378	4	373	$37.68
52.0399	Accounting and Related Services, Other	387	19	368	$22.88
47.0604	Automobile/Automotive Mechanics Technology/Technician	299	-	299	$22.85
47.0201	Heating, Air Conditioning, Ventilation and Refrigeration Maintenance Technology/Technician	192	-	192	$26.65
15	Engineering Technology, General	127	-	127	$31.32
43.0203	Fire Science/Fire-fighting	126	1	125	$27.84
51.0602	Dental Hygiene/Hygienist	119	-	119	$47.43
51.0904	Emergency Medical Technology/Technician (EMT Paramedic)	83	-	83	$25.12
51.1004	Clinical/Medical Laboratory Technician	72	-	72	$21.34
45.0101	Social Sciences, General	109	57	52	$32.08
52.0901	Hospitality Administration/Management, General	48	7	41	$26.45
51.0806	Physical Therapy Technician/Assistant	31	-	31	$20.17
51.0808	Veterinary/Animal Health Technology/Technician and Veterinary Assistant	27	-	27	$17.21
51.0707	Health Information/Medical Records Technology/Technician	25	-	25	$22.24
15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	44	24	20	$35.13
41.0101	Biology Technician/Biotechnology Laboratory Technician	20	-	20	$22.79
14.0101	Engineering, General	24	5	19	$64.62
50.0401	Design and Visual Communications, General	45	26	18	$29.52
1.0601	Applied Horticulture/Horticulture Operations, General	18	-	18	$16.49
51.0911	Radiologic Technology/Science - Radiographer	11	-	11	$33.71
51.0908	Respiratory Care Therapy/Therapist	11	1	9	$30.81
51.1599	Mental and Social Health Services and Allied Professions, Other	2	-	2	$19.73
4.0901	Architectural Technology/Technician	1	-	1	$25.83
50.9999	Visual and Performing Arts, Other	4	4	1	$26.43
51.091	Diagnostic Medical Sonography/Sonographer and Ultrasound Technician	10	10	1	$36.69
16.1603	Sign Language Interpretation and Translation	7	11	(3)	$32.29
50.0605	Photography	4	17	(13)	$17.69
30.0101	Biological and Physical Sciences	4	32	(29)	$62.55
50.0408	Interior Design	36	81	(45)	$27.28
52.0299	Business Administration, Management and Operations, Other	62	107	(45)	$49.09
52.0903	Tourism and Travel Services Management	16	63	(47)	$57.42
50.0101	Visual and Performing Arts, General	31	125	(95)	$24.77
51.3801	Registered Nursing/Registered Nurse	559	674	(115)	$36.57
43.0103	Criminal Justice/Law Enforcement Administration	27	210	(183)	$51.36

Source: EMSI Gap Analysis Model
Numbers may not sum due to rounding.

TABLE 2.5: SUPPLY AND DEMAND FOR OCCUPATIONS AT THE BACHELOR'S DEGREE LEVEL

SOC	SOC TITLE	AVERAGE ANNUAL OPENINGS	AVERAGE ANNUAL COMPLETERS	GAP	MEDIAN HOURLY EARNINGS
15-1132	Software Developers, Applications	941	142	800	$52.25
13-2011	Accountants and Auditors	1,246	482	764	$39.42
15-1121	Computer Systems Analysts	654	111	544	$50.29
15-1142	Network and Computer Systems Administrators	516	28	487	$45.52
13-1161	Market Research Analysts and Marketing Specialists	678	213	465	$33.49
25-2021	Elementary School Teachers, Except Special Education	410	37	373	$31.73
13-1111	Management Analysts	955	607	348	$44.00
15-1133	Software Developers, Systems Software	643	303	339	$53.99
15-1131	Computer Programmers	372	37	335	$40.10
13-1071	Human Resources Specialists	334	5	329	$42.05
25-3098	Substitute Teachers	328	1	327	$14.80
15-1199	Computer Occupations, All Other	348	94	254	$52.13
25-3099	Teachers and Instructors, All Other	247	1	246	$28.75
13-1151	Training and Development Specialists	243	0	243	$35.90
15-1122	Information Security Analysts	308	66	242	$52.72
27-3031	Public Relations Specialists	331	109	222	$41.13
13-1121	Meeting, Convention, and Event Planners	210	6	204	$30.67
41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	197	3	194	$42.85
11-3021	Computer and Information Systems Managers	372	179	193	$71.48
15-1143	Computer Network Architects	241	51	190	$53.76
13-1081	Logisticians	173	-	173	$45.88
25-2031	Secondary School Teachers, Except Special and Career/Technical Education	256	89	167	$31.84
13-1041	Compliance Officers	161	-	161	$39.30
15-1141	Database Administrators	163	10	153	$48.15
17-2141	Mechanical Engineers	170	21	149	$48.64
27-2022	Coaches and Scouts	194	53	141	$20.20
17-2051	Civil Engineers	213	74	139	$41.53
39-9032	Recreation Workers	145	8	137	$13.85
11-3031	Financial Managers	330	194	136	$65.43
25-2022	Middle School Teachers, Except Special and Career/Technical Education	176	55	121	$31.20
11-3121	Human Resources Managers	113	0	112	$67.03
27-3042	Technical Writers	102	-	102	$38.80
53-2011	Airline Pilots, Copilots, and Flight Engineers	92	-	92	$53.59
11-2031	Public Relations and Fundraising Managers	91	-	91	$67.73
13-2051	Financial Analysts	263	176	88	$42.17
11-1021	General and Operations Managers	979	896	84	$65.73
25-2012	Kindergarten Teachers, Except Special Education	84	2	82	$28.09
11-2021	Marketing Managers	156	75	80	$69.90
21-1021	Child, Family, and School Social Workers	132	52	79	$26.32
17-2061	Computer Hardware Engineers	68	1	67	$55.38
19-2041	Environmental Scientists and Specialists, Including Health	102	35	67	$50.67
11-3061	Purchasing Managers	70	4	66	$63.14

SOC	SOC TITLE	AVERAGE ANNUAL OPENINGS	AVERAGE ANNUAL COMPLETERS	GAP	MEDIAN HOURLY EARNINGS
21-2021	Directors, Religious Activities and Education	65	-	65	$29.03
17-2072	Electronics Engineers, Except Computer	87	22	65	$55.48
17-2011	Aerospace Engineers	61	-	61	$64.05
17-2071	Electrical Engineers	85	29	56	$51.45
17-2081	Environmental Engineers	56	-	56	$50.95
17-2112	Industrial Engineers	56	-	56	$46.25
21-2011	Clergy	55	-	55	$24.39
13-2072	Loan Officers	117	62	54	$36.00
13-1141	Compensation, Benefits, and Job Analysis Specialists	54	0	54	$35.63
13-2031	Budget Analysts	168	116	52	$43.82
17-1011	Architects, Except Landscape and Naval	94	47	47	$39.20
15-2031	Operations Research Analysts	179	132	46	$48.34
25-2052	Special Education Teachers, Kindergarten and Elementary School	45	0	45	$31.61
29-2011	Medical and Clinical Laboratory Technologists	77	33	44	$30.30
13-2099	Financial Specialists, All Other	78	38	40	$40.78
21-1023	Mental Health and Substance Abuse Social Workers	39	1	38	$26.34
29-9011	Occupational Health and Safety Specialists	35	-	35	$40.27
13-2052	Personal Financial Advisors	102	66	35	$38.39
11-3131	Training and Development Managers	31	0	30	$55.71
13-1075	Labor Relations Specialists	29	0	29	$34.91
11-9039	Education Administrators, All Other	26	-	26	$45.01
25-2054	Special Education Teachers, Secondary School	25	0	25	$33.77
11-9031	Education Administrators, Preschool and Childcare Center/Program	24	-	24	$22.05
25-9099	Education, Training, and Library Workers, All Other	22	0	22	$22.69
25-2059	Special Education Teachers, All Other	21	0	21	$42.28
19-1031	Conservation Scientists	21	-	21	$35.83
19-4021	Biological Technicians	20	-	20	$22.79
17-2041	Chemical Engineers	22	2	20	$62.51

Source: EMSI Gap Analysis Model

tional certificates or associate's degree. These selected occupations present unmet annual openings by completions within the region. Please note that these tables highlight particular occupations, and in many cases, a program can be designed to train for multiple occupations. Once these occupations are grouped with other similar occupations the actual workforce gap may be larger. Therefore, several programs with relatively small gaps are included. The median hourly earnings for workers in the service region are included in the table. Finally, the most common level of education for entry level participants in the occupation is included.

Institutions either aren't training students or aren't training a sufficient number of students for the following healthcare related occupations: licensed practical & licensed vocational nurses, dental assistants, surgical technologists, and others. Heavy & tractor-trailer truck drivers; air traffic controllers, and audio & video equipment technicians are three other areas of opportunity. There are 17 areas of opportunity listed for certificate and 13 areas of opportunity for associate's degree level completers.

Table 2.4 on the following page displays the supply and demand at the bachelor's degree level for programs already offered by NOVA. While many of these areas would not be practical at this higher education level, others are already being offered by other regional institutions. This table will allow NOVA to see the demand for students that plan to further their education elsewhere in the same type of program.

Table 2.5 shows the top 70 occupations that are undersupplied where the typical entry level worker has a bachelor's degree. Some of these occupations are being trained for by regional institutions. Many are even being trained for by NOVA at a lower education level. However, demand at the bachelor's degree level remains unmet. This table will help NOVA identify areas to increase the number of students trained who will ultimately transfer to four year programs that produce graduates for occupations that are in demand in the NOVA Service Region..

CONCLUSION

Between both the postsecondary certificate and associate's degree levels, there are a total of 42 programs associated with demonstrable workforce gaps. Ten of these programs exhibit a significant gap at both award levels. There were six surpluses identified at both levels for NOVA. Only Clinical/Medical Laboratory Technician had a significant surplus at both award levels.

At the postsecondary certificate level there are 18 significant gaps. The top three were in General Cooking & Related Culinary Arts, General Construction Trades, and Child Care Provider/Assistant. For the associate's degree analysis, there were 24 significant gaps. The programs with the largest gaps at this completion level were General Construction Trades, General Business Administration & Management, and Child Care Provider/Assistant.

There were fewer programs training completers for occupations that are being over supplied in the NOVA Service Region. At the postsecondary certificate level, significant surpluses were identified in Clinical/Medical Laboratory Technician and Massage Therapy/Therapeutic Massage. For the associate's degree analysis, there were a total of four programs with surpluses. The top three were: Biological & Physical Science, Criminal Justice/Law Enforcement Administration, and Clinical/Medical Laboratory Technician.

It is important to consider wages when considering which programs to bolster or add. Child Care Provider/Assistant may show a gap, but the median hourly earnings are below $11. Manicurists & Pedicurists is a relatively low paying occupation, making $10 an hour, and was therefore left out of the programmatic areas of opportunity. On the other hand, Electrical & Electronics Repairers, Commercial & Industrial Equipment make a median wage of almost $31 an hour in the region. Many of the areas of opportunity have median hourly earnings in excess of $20 an hour.

APPENDIX 1:
ABOUT EMSI DATA

As stated in Chapter 2, EMSI data were used to calculate the projected number of annual job openings from 2014 to 2024. These projections take into account openings due to job growth and openings due to replacement needs. In order to capture a complete picture of industry employment, EMSI gathers and integrates economic, labor market, demographic, and education data from over 90 government and private-sector sources, creating a comprehensive and current database that includes both published data and detailed estimates with full coverage of the United States.

More specifically, EMSI develops this data by combining covered employment data from Quarterly Census of Employment and Wages (QCEW) produced by the Department of Labor with total employment data in Regional Economic Information System (REIS) published by the Bureau of Economic Analysis (BEA). This is augmented with County Business Patterns (CBP) and Nonemployer Statistics (NES) published by the US Census Bureau. Projections are based on the latest-available EMSI industry data, 15-year past local trends in each industry, growth rates in statewide and (where available) sub-state area industry projections published by individual state agencies, and (in part) growth rates in national projections from the Bureau of Labor Statistics.

Through this combination of data sources, EMSI is able to fill gaps in individual sources (such as suppressions and missing proprietors). This yields a composite database that leverages the strengths of all its sources. Finally, EMSI's database is updated quarterly, providing the most up-to-date integrated information possible.

APPENDIX 2:
PROGRAM-TO-OCCUPATION MAPPING

Table A2.1 displays the crosswalk between educational programs (CIP codes) and occupations (SOC codes) that EMSI used to complete the gap analysis. Also listed are the adjustment factors that were applied to the annual openings figures for each occupation within each program. The methodology for these factors is described in Appendix 3, with the program based weight figure recounted under "De-duplication of Annual Openings" and the educational level adjustments recounted under "Education Level Adjustments."

TABLE A2.1: PROGRAM TO OCCUPATION MAPPING WITH EMPLOYMENT ADJUSTMENT FACTORS

					PERCENT OF WORKFORCE WITH GIVEN EDUCATION LEVEL	
CIP	PROGRAM	SOC	OCCUPATION	PROGRAM BASED WEIGHT	PSV AWARD OR SOME COLLEGE	ASSOCIATE'S DEGREE
1.0601	Applied Horticulture/Horticulture Operations, General	11-9013	Farmers, Ranchers, and Other Agricultural Managers	1.00	71	79
		37-3019	Grounds Maintenance Workers, All Other	0.94	89	94
4.0901	Architectural Technology/ Technician	17-3011	Architectural and Civil Drafters	0.17	41	73
10.0299	Audiovisual Communications Technologies/Technicians, Other	25-9011	Audio-Visual and Multimedia Collections Specialists	0.05	17	21
		27-3099	Media and Communication Workers, All Other	0.13	37	50
		27-4012	Broadcast Technicians	0.60	50	63
		27-4031	Camera Operators, Television, Video, and Motion Picture	0.03	32	39
		27-4032	Film and Video Editors	0.02	32	39
		27-4099	Media and Communication Equipment Workers, All Other	1.00	50	63
11.0101	Computer and Information Sciences, General	11-3021	Computer and Information Systems Managers	0.22	19	27
		15-1111	Computer and Information Research Scientists	0.15	6	9
		15-1121	Computer Systems Analysts	0.23	20	28
		15-1122	Information Security Analysts	0.16	29	43
		15-1134	Web Developers	0.16	23	31
		15-1141	Database Administrators	0.69	22	32
		15-1142	Network and Computer Systems Administrators	0.69	34	49
		15-1143	Computer Network Architects	0.16	27	41
		15-1199	Computer Occupations, All Other	0.23	34	49

					PERCENT OF WORKFORCE WITH GIVEN EDUCATION LEVEL	
CIP	PROGRAM	SOC	OCCUPATION	PROGRAM BASED WEIGHT	PSV AWARD OR SOME COLLEGE	ASSOCIATE'S DEGREE
11.0103	Information Technology	15-1111	Computer and Information Research Scientists	0.36	6	9
		15-1121	Computer Systems Analysts	0.53	20	28
		15-1122	Information Security Analysts	0.37	29	43
		15-1132	Software Developers, Applications	0.56	11	16
		15-1133	Software Developers, Systems Software	0.37	11	16
		15-1134	Web Developers	0.37	23	31
		15-1143	Computer Network Architects	0.37	27	41
11.0701	Computer Science	11-3021	Computer and Information Systems Managers	0.19	19	27
		15-1111	Computer and Information Research Scientists	0.13	6	9
		15-1122	Information Security Analysts	0.14	29	43
		15-1131	Computer Programmers	0.81	19	28
		15-1132	Software Developers, Applications	0.21	11	16
		15-1133	Software Developers, Systems Software	0.13	11	16
		15-1134	Web Developers	0.14	23	31
		15-1143	Computer Network Architects	0.14	27	41
		15-1151	Computer User Support Specialists	0.33	40	57
		15-1152	Computer Network Support Specialists	0.33	40	57
		15-1199	Computer Occupations, All Other	0.20	34	49
11.0801	Web Page, Digital/Multimedia and Information Resources Design	15-1122	Information Security Analysts	0.02	29	43
		15-1134	Web Developers	0.02	23	31
		15-1143	Computer Network Architects	0.02	27	41
		27-1014	Multimedia Artists and Animators	0.19	34	43
		27-1024	Graphic Designers	0.14	31	44
12.05	Cooking and Related Culinary Arts, General	35-1011	Chefs and Head Cooks	0.15	70	86
		35-1012	First-Line Supervisors of Food Preparation and Serving Workers	0.68	78	86
		35-2012	Cooks, Institution and Cafeteria	1.00	90	95
		35-2014	Cooks, Restaurant	0.15	90	95
		35-2019	Cooks, All Other	0.15	90	95
		35-2021	Food Preparation Workers	1.00	87	92
		39-9021	Personal Care Aides	0.77	80	88
13.1501	Teacher Assistant/Aide	25-9041	Teacher Assistants	1.00	62	76
14.0101	Engineering, General	11-9041	Architectural and Engineering Managers	0.08	11	16
		17-2199	Engineers, All Other	0.24	11	18
14.3801	Surveying Engineering	11-9041	Architectural and Engineering Managers	0.01	11	16
		17-2199	Engineers, All Other	0.02	11	18
15	Engineering Technology, General	17-3021	Aerospace Engineering and Operations Technicians	0.80	60	83
		17-3022	Civil Engineering Technicians	0.97	60	83

					PERCENT OF WORKFORCE WITH GIVEN EDUCATION LEVEL	
CIP	PROGRAM	SOC	OCCUPATION	PROGRAM BASED WEIGHT	PSV AWARD OR SOME COLLEGE	ASSOCIATE'S DEGREE
		17-3023	Electrical and Electronics Engineering Technicians	0.06	60	83
		17-3024	Electro-Mechanical Technicians	1.00	60	83
		17-3025	Environmental Engineering Technicians	1.00	60	83
		17-3026	Industrial Engineering Technicians	0.06	60	83
		17-3027	Mechanical Engineering Technicians	0.95	60	83
		17-3029	Engineering Technicians, Except Drafters, All Other	0.97	60	83
		17-3031	Surveying and Mapping Technicians	0.38	68	89
15.0201	Civil Engineering Technology/Technician	17-3022	Civil Engineering Technicians	0.03	60	83
15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	17-3023	Electrical and Electronics Engineering Technicians	0.71	60	83
15.1302	CAD/CADD Drafting and/or Design Technology/Technician	17-3011	Architectural and Civil Drafters	0.63	41	73
15.1303	Architectural Drafting and Architectural CAD/CADD	17-3011	Architectural and Civil Drafters	0.16	41	73
16.1603	Sign Language Interpretation and Translation	27-3091	Interpreters and Translators	0.10	37	50
19.0709	Child Care Provider/Assistant	39-9011	Childcare Workers	0.79	75	84
22.0302	Legal Assistant/Paralegal	23-2011	Paralegals and Legal Assistants	0.90	38	58
		23-2093	Title Examiners, Abstractors, and Searchers	0.96	46	59
		23-2099	Legal Support Workers, All Other	0.93	46	59
23.1303	Professional, Technical, Business, and Scientific Writing	27-3041	Editors	0.01	12	16
		27-3042	Technical Writers	1.00	19	26
		27-3043	Writers and Authors	0.01	12	15
30.0101	Biological and Physical Sciences	11-9121	Natural Sciences Managers	0.19	7	11
31.0301	Parks, Recreation and Leisure Facilities Management, General	39-9032	Recreation Workers	0.06	45	55
41.0101	Biology Technician/Biotechnology Laboratory Technician	19-4021	Biological Technicians	1.00	37	46
43.0103	Criminal Justice/Law Enforcement Administration	33-1012	First-Line Supervisors of Police and Detectives	0.62	44	59
43.0106	Forensic Science and Technology	19-4092	Forensic Science Technicians	1.00	42	54
		33-9031	Gaming Surveillance Officers and Gaming Investigators	0.22	74	84
43.0203	Fire Science/Fire-fighting	33-2011	Firefighters	1.00	59	79
		33-2021	Fire Inspectors and Investigators	1.00	53	71
		33-2022	Forest Fire Inspectors and Prevention Specialists	1.00	53	71
44.0401	Public Administration	11-1011	Chief Executives	0.06	27	33
		11-1021	General and Operations Managers	0.06	42	51

					PERCENT OF WORKFORCE WITH GIVEN EDUCATION LEVEL	
CIP	PROGRAM	SOC	OCCUPATION	PROGRAM BASED WEIGHT	PSV AWARD OR SOME COLLEGE	ASSOCIATE'S DEGREE
		11-1031	Legislators	0.12	27	33
		11-3011	Administrative Services Managers	0.07	48	59
		11-3071	Transportation, Storage, and Distribution Managers	0.07	63	71
		11-9131	Postmasters and Mail Superintendents	1.00	38	46
		11-9151	Social and Community Service Managers	0.06	25	31
		11-9199	Managers, All Other	0.05	38	46
45.0101	Social Sciences, General	19-3099	Social Scientists and Related Workers, All Other	0.96	6	10
		19-4061	Social Science Research Assistants	1.00	42	54
46	Construction Trades, General	11-9021	Construction Managers	0.00	59	66
		47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	0.32	82	89
		47-2011	Boilermakers	1.00	87	97
		47-2021	Brickmasons and Blockmasons	1.00	93	96
		47-2022	Stonemasons	1.00	93	96
		47-2031	Carpenters	1.00	87	93
		47-2041	Carpet Installers	1.00	92	95
		47-2042	Floor Layers, Except Carpet, Wood, and Hard Tiles	1.00	92	95
		47-2043	Floor Sanders and Finishers	1.00	92	95
		47-2044	Tile and Marble Setters	1.00	92	95
		47-2051	Cement Masons and Concrete Finishers	1.00	96	97
		47-2053	Terrazzo Workers and Finishers	1.00	96	97
		47-2071	Paving, Surfacing, and Tamping Equipment Operators	1.00	97	99
		47-2072	Pile-Driver Operators	1.00	93	97
		47-2073	Operating Engineers and Other Construction Equipment Operators	1.00	93	97
		47-2081	Drywall and Ceiling Tile Installers	1.00	96	98
		47-2082	Tapers	1.00	96	98
		47-2111	Electricians	1.00	79	93
		47-2121	Glaziers	1.00	91	95
		47-2131	Insulation Workers, Floor, Ceiling, and Wall	1.00	94	97
		47-2132	Insulation Workers, Mechanical	1.00	94	97
		47-2141	Painters, Construction and Maintenance	1.00	89	93
		47-2142	Paperhangers	1.00	86	93
		47-2151	Pipelayers	1.00	89	96
		47-2152	Plumbers, Pipefitters, and Steamfitters	1.00	89	96
		47-2161	Plasterers and Stucco Masons	1.00	94	98
		47-2171	Reinforcing Iron and Rebar Workers	1.00	92	96
		47-2181	Roofers	1.00	95	97

					PERCENT OF WORKFORCE WITH GIVEN EDUCATION LEVEL	
CIP	PROGRAM	SOC	OCCUPATION	PROGRAM BASED WEIGHT	PSV AWARD OR SOME COLLEGE	ASSOCIATE'S DEGREE
		47-2211	Sheet Metal Workers	1.00	90	97
		47-2221	Structural Iron and Steel Workers	1.00	91	96
		47-3011	Helpers--Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters	1.00	94	97
		47-3012	Helpers--Carpenters	1.00	94	97
		47-3013	Helpers--Electricians	1.00	94	97
		47-3014	Helpers--Painters, Paperhangers, Plasterers, and Stucco Masons	1.00	94	97
		47-3015	Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters	1.00	94	97
		47-3016	Helpers--Roofers	1.00	94	97
		47-3019	Helpers, Construction Trades, All Other	1.00	94	97
47.0201	Heating, Air Conditioning, Ventilation and Refrigeration Maintenance Technology/ Technician	49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	1.00	83	96
47.0604	Automobile/Automotive Mechanics Technology/Technician	49-2093	Electrical and Electronics Installers and Repairers, Transportation Equipment	1.00	64	89
		49-2096	Electronic Equipment Installers and Repairers, Motor Vehicles	1.00	76	95
		49-3023	Automotive Service Technicians and Mechanics	1.00	85	96
47.0605	Diesel Mechanics Technology/ Technician	49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	1.00	87	97
48.0508	Welding Technology/Welder	51-4121	Welders, Cutters, Solderers, and Brazers	1.00	92	98
		51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	1.00	92	98
50.0101	Visual and Performing Arts, General	27-1012	Craft Artists	0.81	34	43
		27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators	0.62	34	43
		27-1019	Artists and Related Workers, All Other	0.47	34	43
		27-4021	Photographers	0.63	42	52
50.0401	Design and Visual Communications, General	27-1021	Commercial and Industrial Designers	0.98	31	44
		27-1024	Graphic Designers	0.31	31	44
		27-1027	Set and Exhibit Designers	0.98	31	44
		27-1029	Designers, All Other	1.00	31	44
50.0408	Interior Design	27-1025	Interior Designers	1.00	31	44
50.0605	Photography	27-4021	Photographers	0.11	42	52
50.9999	Visual and Performing Arts, Other	27-1019	Artists and Related Workers, All Other	0.04	34	43
		27-2042	Musicians and Singers	0.11	40	46

APPENDIX 3:
PROGRAM GAP ANALYSIS METHODOLOGY

This appendix focuses on describing and understanding the methodology used in the program gap analysis. This requires data on both occupation demand (e.g., annual job openings) and education supply (e.g., number of postsecondary degree completions). These are then compared through an education "gap" analysis to determine whether an education program is potentially producing a surplus or shortage of workforce talent relative to the number of job openings. In this way, it is possible to see how the institution's current programs are satisfying regional workforce needs.

SUPPLY AND DEMAND MODEL

Using demand-side data (average annual openings) and supply-side data (postsecondary education output), EMSI builds a model to compare workforce demand with education supply. The purpose of this analysis is to find the difference or "gap" between the average annual openings for an occupation and the number of people completing postsecondary degrees for that occupation, whether at NOVA or at another training provider within one of the regions. This made it possible to identify whether there may be talent shortages or surpluses within the service region.

The first step involves mapping the linkage between annual openings for a SOC code and the number of completions for an education program CIP code. The BLS provides information on the occupations that completers of specific CIP codes are more likely to enter. Specific connections have been refined through previous engagements with education institutions and state departments of labor. Some programs have direct occupational ties. For example, a physical therapist assistant is a specific occupation that requires specialized postsecondary training. In this case, one CIP code (physical therapy technician/assistant) maps to only one SOC code (physical therapists assistants). This provides an easy comparison of annual openings for physical therapist assistants to the number of people completing the relevant program to see whether a talent shortage or surplus exists. Unfortunately, this is not always the case. More often than not an educational program maps to multiple occupations and an occupation maps to multiple educational programs. For this reason, EMSI has pioneered a method of de-duplicating completers, such that the potential sources of supply are not double-counted for any occupation. The details of this process are outlined in this chapter, under "De-duplication of Annual Openings."

OCCUPATION DEMAND

Educational Level Adjustments

To capture occupation demand, EMSI uses a proprietary employment dataset that reflects total employment (i.e., employment covered by unemployment insurance as well as proprietor employment). The employment data reflects jobs for the second quarter of 2014. Within this dataset, EMSI calculated the number of regional annual job openings for the occupations that require two different levels of postsecondary training.[6] The BLS also provides educational attainment data of current workers for each SOC code, broken out by their highest level of education attained. The data is presented as the percentage of workers in the SOC code with educational attainment ranging from less than a high school degree to an associate's degree. Using these data, EMSI adjusted the annual opening estimates for each SOC code to only incorporate the percentage of workers for three different educational levels that correspond with NOVA's program offerings.

For example, as shown in Table A3.1, there are three occupations trained for by Corrections (CIP code 43.0102).

6 See Appendix 1 for a description of the sources and processes of EMSI data.

TABLE A3.1: EDUCATIONAL LEVEL ADJUSTMENTS

CIP CODE	CIP TITLE	SOC	TITLE	"SOME COLLEGE, NO DEGREE" OR POST-SECONDARY AWARD OR LOWER	ASSOCIATE'S DEGREE OR LOWER
43.0102	Corrections	33-3012	Correctional Officers and Jailers	75%	88%
		33-1012	First-Line Supervisors of Police and Detectives	46%	62%
		33-1011	First-Line Supervisors of Correctional Officers	61%	75%
	Weighted Average			**68%**	**85%**

Within that cluster are an assortment of career fields, including correctional officers and jailers, first-line supervisors of police and detectives, and first-line supervisors of correctional officers. Among correctional officers, the majority of job openings (75%) are available to somebody with "some college" or a postsecondary vocational award. Alternatively, for first-line supervisors of police and detectives, only 46% of job openings are accessible to a person without a college degree. The weighted average of job openings is calculated for each program at each program/degree level where NOVA has produced completers over the past three years. Not taking into account the educational attainment dynamics in this way would bias the result by over-counting potential job opportunities for completers.[7]

De-duplication of Annual Openings

Most educational programs are designed to train people for multiple occupational types, many of which are simultaneously linked with other educational programs, presenting a complexity when comparing supply and demand for any particular educational program. For instance, the Computer Systems Networking & Telecommunications program is mapped to three different occupations: computer support specialists, information security analysts, and computer systems analysts. If we focus on just one of the occupations for this list—computer support specialists—it is also mapped to 10 different educational programs, spanning program titles such as Computer Systems Analysis to Medical Office Computer Specialist.

To ensure that no double-counting occurs, it is necessary either to realign the program groupings to eliminate the mapping of occupations to multiple programs or to determine what proportion of demand should be compared with supply numbers from each program. EMSI takes the second approach in this analysis, which has the advantage of maintaining the program titles and descriptions in roughly the same format that completer data were originally delivered to EMSI. EMSI uses a formula that favors program types with the largest number of completers, attributing a greater proportion of demand to these than the programs which produce a smaller number of completers. This method utilizes the assumption that the higher output educational programs are likely feeding a higher degree of demand within the service region.[8] Appendix 2 contains the detailed mapping of each CIP code to all relevant occupations.

One possible criticism of this methodology is that it assumes, all else being equal, students from higher-output programs are more likely to obtain a job than students from lower-output programs, whereas in reality students are judged more by their skills and merits than their educational program of study. The intention of the analysis is not to rate students' capability of competing for jobs, but rather to capture the unique dynamics of the local labor market. For example, in a region where a unique program such as Commercial and Advertising Art is more prevalent than Graphic Design, it can safely be assumed that the graduates of the Commercial and Advertising Art program will be offered a larger number of local openings than are students from the Graphic Design program. If such were not the case, it would be unlikely for the Commercial and Advertising Art program to remain the producer of local talent in the long-term, as the program would yield students to a program with a more successful job placement rate.

Recognizing that some smaller programs produce students who are more capable of obtaining local jobs than students from larger programs, EMSI also provides an

7 Given the changing dynamics and need for more education in the existing workforce (i.e., skills-biased technology change in many occupations and industry sectors), this assumption is considered conservative.

8 Note this adjustment is performed on a program-by-program basis without consideration of individual colleges or training providers. Therefore, a single program offered at one large institution has no advantage over a group of similar programs offered a number of smaller educational providers provided that the aggregate output of the smaller schools is near the output of the single larger school.

alternative gap analysis, which does not reduce the number of annual openings based on the size of each educational program. Rather the total number of annual openings available for students at each educational level is provided without further modification. Due to this modification, these numbers have not been de-duplicated, unlike the annual openings figures shown in Chapter 2. These figures are provided in Appendix 4: Alternative Supply and Demand Calculations.

EDUCATION OUTPUT

There are several educational institutions in the service region, some of which have programs similar to those offered at NOVA. Hence completers at NOVA will be competing for some jobs with completers from other regional institutions. EMSI determined education output by Classification of Instructional Program (CIP) codes and identified the number of completers for every award level within those CIP codes. To find the output for all public and private education institutions in the service region, EMSI used data from the Integrated Postsecondary Educational System (IPEDS).[9] These data are publicly available through the National Center for Educational Statistics. Completions data were averaged for the three-year period, 2011 through 2014, to smooth out any bumps in enrollment that may be unique to a particular academic year.

Table A3.2 displays the breakdown by institution for postsecondary certificate level completions. Forty-five institutions fall under this category, and they produced an average of 5,512 completers per year. Of those, 38% graduated from NOVA. Table A3.3 on the next page displays these data just at the associate's degree level. Only 31 institutions are offering associate's degrees in the region, producing an average of 7,460 graduates per year. NOVA produced 5,261 associate's degree graduates which comprised 71% of the total. Considering all certificate and associate's degree level completers, there were 12,972 completers per year on average, and of those, NOVA produced 57%.

9 These data come with inherent weaknesses. First, numbers are only available for institutions that participate in or are applicants for any federal financial assistance program authorized by the Higher Education Act (HEA). Also, IPEDS does not account for the fact that some people may receive multiple degrees or certifications, so when the number of degrees awarded exceeds the number of people receiving the degrees, the number of completers can be overstated. Nevertheless, this system is the best source for collecting data regarding a broad range of educational institutions.

TABLE A3.2: SUMMARY OF POSTSECONDARY CERTIFICATE LEVEL REGIONAL COMPLETIONS BY INSTITUTION

INSTITUTION	3-YEAR AVERAGE	PERCENT OF TOTAL
ACT College	73	1%
American University	42	1%
Avi Career Training	33	1%
Aviation Institute of Maintenance-Manassas	71	1%
Bennett Career Institute	72	1%
Career Technical Institute	341	6%
Catholic University of America	8	<1%
Centura College-Alexandria	29	1%
CET-Alexandria	93	2%
Columbia College	127	2%
Corcoran College of Art and Design	6	<1%
Cosmopolitan Beauty and Tech School	88	2%
Court Reporting Institute of Arlington	2	<1%
Everest College-Arlington	136	2%
Everest College-McLean	225	4%
Everest College-Woodbridge	7	<1%
George Washington University	150	3%
Georgetown University	10	<1%
Global Health College	65	1%
Graham Webb International Academy of Hair	129	2%
Heritage Institute-Manassas	24	<1%
Howard University	10	<1%
Marymount University	3	<1%
Medtech Institute	999	18%
National Conservatory of Dramatic Arts	21	<1%
Northern Virginia Community College	2,112	38%
Northern Virginia School of Therapeutic Massage	92	2%
Paul Mitchell the School-Mclean	122	2%
Paul Mitchell the School-Woodbridge	2	<1%
Radians College	3	<1%
Regency Beauty Institute-Manassas	43	1%
Sanford-Brown College-Tysons Corner	76	1%
Springfield Beauty Academy	54	1%
Stratford University	7	<1%
Strayer University-District of Columbia	6	<1%
Strayer University-Global Region	8	<1%
Strayer University-Virginia	30	1%
Technical Learning Centers Inc	134	2%
The Art Institute of Washington	28	1%
The Art Institute of Washington-Dulles	1	<1%
University of Management and Technology	5	<1%
University of the Potomac-VA Campus	<1	<1%
University of the Potomac-Washington DC Campus	2	<1%
Westwood College-Annandale	10	<1%
Westwood College-Arlington Ballston	12	<1%
Grand Total	**5,512**	**100%**

Source: National Center for Education Statistics – IPEDS

TABLE A3.3: SUMMARY OF ASSOCIATE'S DEGREE REGIONAL COMPLETIONS BY INSTITUTION

INSTITUTION	3-YEAR AVERAGE	PERCENT OF TOTAL
ACT College	17	<1%
American University	1	<1%
Aviation Institute of Maintenance-Manassas	5	<1%
Catholic University of America	11	<1%
Columbia College	11	<1%
Corcoran College of Art and Design	4	<1%
DeVry University-Virginia	20	<1%
Everest College-Arlington	58	1%
Everest College-McLean	29	<1%
George Washington University	164	2%
Global Health College	18	<1%
Heritage Institute-Manassas	37	1%
ITT Technical Institute-Chantilly	185	2%
ITT Technical Institute-Springfield	234	3%
Medtech Institute	13	<1%
Northern Virginia Community College	5,261	71%
Radians College	9	<1%
Sanford-Brown College-Tysons Corner	265	4%
Stratford University	164	2%
Strayer University-District of Columbia	54	1%
Strayer University-Global Region	80	1%
Strayer University-Virginia	272	4%
The Art Institute of Washington	135	2%
The Art Institute of Washington-Dulles	3	<1%
Trinity Washington University	13	<1%
University of Management and Technology	140	2%
University of the District of Columbia	209	3%
University of the Potomac-VA Campus	0	<1%
University of the Potomac-Washington DC Campus	23	<1%
Westwood College-Annandale	16	<1%
Westwood College-Arlington Ballston	6	<1%
Grand Total	**7,460**	**100%**

Source: National Center for Education Statistics – IPEDS

APPENDIX 4:
ALTERNATIVE GAP ANALYSIS CALCULATIONS

EMSI de-duplicated the annual openings shown in Chapter 2 to account for the magnitude of output from different educational programs in the region. The process is explained in detail in Appendix 3 under "De-duplication of Annual Openings." This procedure is designed to reflect the unique supply and demand dynamics of each regional economy. However, EMSI also recognizes that in some cases a student from a less predominant educational program is a more likely candidate to be offered a local job. These alternative supply and demand calculations give equal weight to every job opportunity within students' field of study, regardless of whether that program is a big or small player in talent development for the region. Therefore, these estimates should be considered as less conservative measures than those from Chapter 2.

HIGHLIGHTS OF ALTERNATIVE GAP ANALYSIS

Most programs have a similar gap/surplus amount, as the previous calculations show in Tables 2.1 through 2.2, but there are a few notable changes. Among certificate level programs, there are now 26 significant gaps, 12 more than in Table 2.1. General Cooking & Related Culinary Arts now has a gap of 2,316. Public Administration moved from a small gap to a very large gap of 1,237. Several other programs have larger gaps than indicated with the previous method. The significant surpluses still have the same two largest programs in the same order. The associate's degree level programs with the largest gaps remain relatively unchanged. There are six new programs with significant gaps. Numerous other programs have larger gaps than indicated with the previous method. The number of surpluses fell from nine to seven..

ALTERNATIVE GAP ANALYSIS TABLES

TABLE A4.1: ALTERNATIVE SUPPLY AND DEMAND FOR NOVA'S POSTSECONDARY CERTIFICATE PROGRAMS

CIP	PROGRAM	AVERAGE ANNUAL OPENINGS	AVERAGE ANNUAL COMPLETERS	NOVA COMPLETERS	TOTAL GAP OR SURPLUS
12.05	Cooking and Related Culinary Arts, General	2,325	9	9	2,316
46	Construction Trades, General	2,046	5	5	2,041
44.0401	Public Administration	1,237	0	0	1,237
11.0101	Computer and Information Sciences, General	1,018	139	32	879
19.0709	Child Care Provider/Assistant	868	65	65	803
52.0299	Business Administration, Management and Operations, Other	571	111	111	460
13.1501	Teacher Assistant/Aide	420	8	8	412
52.0399	Accounting and Related Services, Other	454	77	77	376
52.0903	Tourism and Travel Services Management	367	7	7	359
11.0801	Web Page, Digital/Multimedia and Information Resources Design	372	25	21	348
47.0604	Automobile/Automotive Mechanics Technology/Technician	283	25	25	258
52.0499	Business Operations Support and Secretarial Services, Other	138	1	1	138
47.0201	Heating, Air Conditioning, Ventilation and Refrigeration Maintenance Technology/Technician	182	83	34	98
45.0101	Social Sciences, General	84	2	2	82
52.0901	Hospitality Administration/Management, General	81	13	13	68
50.0401	Design and Visual Communications, General	69	5	5	63
31.0301	Parks, Recreation and Leisure Facilities Management, General	73	10	10	63
51.0999	Allied Health Diagnostic, Intervention, and Treatment Professions, Other	59	1	1	58
23.1303	Professional, Technical, Business, and Scientific Writing	60	3	3	57
47.0605	Diesel Mechanics Technology/Technician	56	2	2	54
51.0904	Emergency Medical Technology/Technician (EMT Paramedic)	77	23	23	54
48.0508	Welding Technology/Welder	59	6	6	52
51.0707	Health Information/Medical Records Technology/Technician	56	18	18	38
50.0101	Visual and Performing Arts, General	37	6	6	31
14.3801	Surveying Engineering	37	9	9	28
15.0201	Civil Engineering Technology/Technician	27	0	0	27
51.0911	Radiologic Technology/Science - Radiographer	25	1	1	24
16.1603	Sign Language Interpretation and Translation	41	19	19	22
10.0299	Audiovisual Communications Technologies/Technicians, Other	27	5	5	22
51.1501	Substance Abuse/Addiction Counseling	28	12	12	16
41.0101	Biology Technician/Biotechnology Laboratory Technician	10	2	2	9
15.1303	Architectural Drafting and Architectural CAD/CADD	15	8	8	7
15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	50	44	44	6
43.0106	Forensic Science and Technology	8	12	11	(3)
15.1302	CAD/CADD Drafting and/or Design Technology/Technician	15	19	19	(4)
43.0103	Criminal Justice/Law Enforcement Administration	26	36	36	(10)
51.3501	Massage Therapy/Therapeutic Massage	42	172	19	(130)

TABLE A4.2: ALTERNATIVE SUPPLY AND DEMAND FOR NOVA'S ASSOCIATE'S DEGREE PROGRAMS

CIP	PROGRAM	AVERAGE ANNUAL OPENINGS	AVERAGE ANNUAL COMPLETERS	NOVA COMPLETERS	TOTAL GAP OR SURPLUS
46	Construction Trades, General	2,192	11	11	2,181
11.0701	Computer Science	1,971	83	73	1,888
52.0201	Business Administration and Management, General	2,484	1,045	952	1,439
11.0101	Computer and Information Sciences, General	1,328	53	53	1,275
19.0709	Child Care Provider/Assistant	917	49	49	868
11.0103	Information Technology	1,186	335	320	851
52.0299	Business Administration, Management and Operations, Other	557	66	62	491
52.0903	Tourism and Travel Services Management	434	3	3	431
52.0399	Accounting and Related Services, Other	439	41	39	398
47.0604	Automobile/Automotive Mechanics Technology/Technician	295	34	34	261
51.1599	Mental and Social Health Services and Allied Professions, Other	261	0	0	261
22.0302	Legal Assistant/Paralegal	303	52	39	251
51.3801	Registered Nursing/Registered Nurse	472	258	208	214
15	Engineering Technology, General	209	12	12	198
47.0201	Heating, Air Conditioning, Ventilation and Refrigeration Maintenance Technology/Technician	127	26	26	101
43.0203	Fire Science/Fire-fighting	107	7	6	100
51.0602	Dental Hygiene/Hygienist	94	33	33	61
52.0901	Hospitality Administration/Management, General	79	28	28	51
50.9999	Visual and Performing Arts, Other	66	15	15	51
51.0904	Emergency Medical Technology/Technician (EMT Paramedic)	76	30	30	46
51.0707	Health Information/Medical Records Technology/Technician	51	22	22	30
16.1603	Sign Language Interpretation and Translation	37	9	9	28
50.0401	Design and Visual Communications, General	93	69	37	24
51.0806	Physical Therapy Technician/Assistant	50	29	29	22
1.0601	Applied Horticulture/Horticulture Operations, General	23	6	6	17
51.0808	Veterinary/Animal Health Technology/Technician and Veterinary Assistant	59	43	41	16
51.0911	Radiologic Technology/Science - Radiographer	61	46	35	15
51.091	Diagnostic Medical Sonography/Sonographer and Ultrasound Technician	23	10	10	13
4.0901	Architectural Technology/Technician	26	18	18	8
50.0408	Interior Design	27	19	19	8
41.0101	Biology Technician/Biotechnology Laboratory Technician	11	4	4	7
50.0605	Photography	19	17	13	3
51.0908	Respiratory Care Therapy/Therapist	26	23	18	3
50.0101	Visual and Performing Arts, General	40	69	69	(28)
15.0303	Electrical, Electronic and Communications Engineering Technology/Technician	25	72	4	(48)
14.0101	Engineering, General	56	128	128	(72)
51.1004	Clinical/Medical Laboratory Technician	17	166	14	(149)
43.0103	Criminal Justice/Law Enforcement Administration	9	166	83	(157)
30.0101	Biological and Physical Sciences	6	318	318	(312)
45.0101	Social Sciences, General	109	530	530	(420)

APPENDIX 5:
DETAILED EMPLOYMENT PROJECTIONS

Table A5.1 displays the occupations that align with one or more of NOVA's educational programs. The programs with which they align can be found in Table A2.1. Table A5.2 displays the occupations that align with one or more of the programs discussed in the analysis of potential new programs (Tables 13 through 14). Note that if an occupation appears in Table A5.1, it is not included in Table A5.2.

TABLE A5.1: DETAILED EMPLOYMENT PROJECTIONS RELATED TO EXISTING PROGRAMS

SOC	OCCUPATION	2014 JOBS	2019 JOBS	CHANGE	PERCENT CHANGE	PROJECTED ANNUAL OPENINGS
11-1011	Chief Executives	6,746	7,158	412	6%	235
11-1021	General and Operations Managers	42,687	46,498	3,811	9%	1608
11-1031	Legislators	120	136	16	13%	6
11-3011	Administrative Services Managers	4,078	4,470	392	10%	149
11-3021	Computer and Information Systems Managers	13,215	14,984	1,769	13%	554
11-3071	Transportation, Storage, and Distribution Managers	1,464	1,526	62	4%	48
11-9013	Farmers, Ranchers, and Other Agricultural Managers	340	313	(27)	(8%)	6
11-9021	Construction Managers	3,976	4,205	229	6%	149
11-9041	Architectural and Engineering Managers	4,667	4,964	297	6%	180
11-9121	Natural Sciences Managers	2,023	2,101	78	4%	61
11-9131	Postmasters and Mail Superintendents	63	69	6	10%	3
11-9151	Social and Community Service Managers	1,620	1,937	317	20%	101
11-9199	Managers, All Other	32,462	33,486	1,024	3%	955
15-1111	Computer and Information Research Scientists	1,137	1,286	149	13%	49
15-1121	Computer Systems Analysts	18,997	22,720	3,723	20%	1081
15-1122	Information Security Analysts	8,295	10,034	1,739	21%	496
15-1131	Computer Programmers	6,812	8,233	1,421	21%	485
15-1132	Software Developers, Applications	28,747	34,708	5,961	21%	1611
15-1133	Software Developers, Systems Software	21,882	25,898	4,016	18%	1117
15-1134	Web Developers	4,523	5,423	900	20%	260
15-1141	Database Administrators	4,197	4,815	618	15%	210
15-1142	Network and Computer Systems Administrators	15,355	17,023	1,668	11%	595
15-1143	Computer Network Architects	8,233	9,285	1,052	13%	354
15-1151	Computer User Support Specialists	14,844	17,747	2,903	20%	842
15-1152	Computer Network Support Specialists	5,215	5,771	556	11%	198
15-1199	Computer Occupations, All Other	17,662	18,297	635	4%	423
17-2199	Engineers, All Other	5,574	5,755	181	3%	149
17-3011	Architectural and Civil Drafters	1,319	1,381	62	5%	36
17-3021	Aerospace Engineering and Operations Technicians	347	369	22	6%	12

SOC	OCCUPATION	2014 JOBS	2019 JOBS	CHANGE	PERCENT CHANGE	PROJECTED ANNUAL OPENINGS
17-3022	Civil Engineering Technicians	1,167	1,247	80	7%	45
17-3023	Electrical and Electronics Engineering Technicians	2,538	2,665	127	5%	83
17-3024	Electro-Mechanical Technicians	46	54	8	17%	3
17-3025	Environmental Engineering Technicians	131	191	60	46%	16
17-3026	Industrial Engineering Technicians	280	288	8	3%	9
17-3027	Mechanical Engineering Technicians	554	597	43	8%	22
17-3029	Engineering Technicians, Except Drafters, All Other	1,122	1,185	63	6%	37
17-3031	Surveying and Mapping Technicians	452	522	70	15%	25
19-3099	Social Scientists and Related Workers, All Other	5,182	5,420	238	5%	140
19-4021	Biological Technicians	449	514	65	14%	28
19-4061	Social Science Research Assistants	2,488	2,844	356	14%	180
19-4092	Forensic Science Technicians	411	422	11	3%	19
23-2011	Paralegals and Legal Assistants	10,120	10,642	522	5%	278
23-2093	Title Examiners, Abstractors, and Searchers	714	733	19	3%	16
23-2099	Legal Support Workers, All Other	8,828	9,221	393	4%	228
25-9011	Audio-Visual and Multimedia Collections Specialists	100	111	11	11%	3
25-9041	Teacher Assistants	12,441	14,275	1,834	15%	676
27-1012	Craft Artists	235	251	16	7%	10
27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators	238	258	20	8%	10
27-1014	Multimedia Artists and Animators	677	760	83	12%	35
27-1019	Artists and Related Workers, All Other	1,350	1,370	20	1%	38
27-1021	Commercial and Industrial Designers	277	285	8	3%	11
27-1024	Graphic Designers	4,464	4,783	319	7%	198
27-1025	Interior Designers	1,624	1,657	33	2%	61
27-1027	Set and Exhibit Designers	227	239	12	5%	9
27-1029	Designers, All Other	102	109	7	7%	5
27-2042	Musicians and Singers	2,292	2,496	204	9%	109
27-3041	Editors	4,950	5,015	65	1%	160
27-3042	Technical Writers	2,433	2,723	290	12%	139
27-3043	Writers and Authors	3,260	3,483	223	7%	123
27-3091	Interpreters and Translators	1,749	2,170	421	24%	112
27-3099	Media and Communication Workers, All Other	565	608	43	8%	17
27-4012	Broadcast Technicians	654	676	22	3%	18
27-4021	Photographers	1,649	1,725	76	5%	41
27-4031	Camera Operators, Television, Video, and Motion Picture	360	368	8	2%	7
27-4032	Film and Video Editors	360	361	1	0%	6
27-4099	Media and Communication Equipment Workers, All Other	859	875	16	2%	15
33-1012	First-Line Supervisors of Police and Detectives	1,582	1,633	51	3%	58
33-2011	Firefighters	3,363	3,534	171	5%	130
33-2021	Fire Inspectors and Investigators	136	143	7	5%	6
33-2022	Forest Fire Inspectors and Prevention Specialists	16	17	1	6%	0
33-9031	Gaming Surveillance Officers and Gaming Investigators	23	26	3	13%	1
35-1011	Chefs and Head Cooks	2,592	2,684	92	4%	64
35-1012	First-Line Supervisors of Food Preparation & Serving Workers	10,422	11,572	1,150	11%	550
35-2012	Cooks, Institution and Cafeteria	3,579	4,032	453	13%	169

SOC	OCCUPATION	2014 JOBS	2019 JOBS	CHANGE	PERCENT CHANGE	PROJECTED ANNUAL OPENINGS
35-2014	Cooks, Restaurant	15,908	17,535	1,627	10%	665
35-2019	Cooks, All Other	400	433	33	8%	15
35-2021	Food Preparation Workers	9,729	10,394	665	7%	427
37-3019	Grounds Maintenance Workers, All Other	450	486	36	8%	19
39-9011	Childcare Workers	18,997	21,751	2,754	14%	1164
39-9021	Personal Care Aides	14,233	18,079	3,846	27%	889
39-9032	Recreation Workers	4,690	5,201	511	11%	162
47-1011	First-Line Supervisors of Construction Trades and Extraction Workers	7,735	8,510	775	10%	274
47-2011	Boilermakers	35	46	11	31%	4
47-2021	Brickmasons and Blockmasons	871	809	(62)	(7%)	32
47-2022	Stonemasons	230	238	8	3%	9
47-2031	Carpenters	11,130	12,055	925	8%	375
47-2041	Carpet Installers	217	227	10	5%	9
47-2042	Floor Layers, Except Carpet, Wood, and Hard Tiles	173	178	5	3%	6
47-2043	Floor Sanders and Finishers	38	40	2	5%	1
47-2044	Tile and Marble Setters	589	609	20	3%	20
47-2051	Cement Masons and Concrete Finishers	2,505	2,932	427	17%	132
47-2053	Terrazzo Workers and Finishers	20	23	3	15%	1
47-2071	Paving, Surfacing, and Tamping Equipment Operators	815	948	133	16%	41
47-2072	Pile-Driver Operators	18	24	6	33%	1
47-2073	Operating Engineers and Other Construction Equipment Operators	2,786	3,220	434	16%	158
47-2081	Drywall and Ceiling Tile Installers	1,577	1,586	9	1%	42
47-2082	Tapers	109	107	(2)	(2%)	3
47-2111	Electricians	6,936	8,093	1,157	17%	383
47-2121	Glaziers	468	544	76	16%	29
47-2131	Insulation Workers, Floor, Ceiling, and Wall	340	365	25	7%	14
47-2132	Insulation Workers, Mechanical	206	252	46	22%	13
47-2141	Painters, Construction and Maintenance	2,948	2,856	(92)	(3%)	88
47-2142	Paperhangers	52	47	(5)	(10%)	1
47-2151	Pipelayers	671	742	71	11%	25
47-2152	Plumbers, Pipefitters, and Steamfitters	4,311	5,030	719	17%	221
47-2161	Plasterers and Stucco Masons	90	100	10	11%	4
47-2171	Reinforcing Iron and Rebar Workers	358	416	58	16%	18
47-2181	Roofers	1,320	1,420	100	8%	57
47-2211	Sheet Metal Workers	1,173	1,339	166	14%	61
47-2221	Structural Iron and Steel Workers	528	613	85	16%	37
47-3011	Helpers--Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters	506	426	(80)	(16%)	15
47-3012	Helpers--Carpenters	749	837	88	12%	32
47-3013	Helpers--Electricians	931	1,155	224	24%	62
47-3014	Helpers--Painters, Paperhangers, Plasterers, & Stucco Masons	129	123	(6)	(5%)	4
47-3015	Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters	673	796	123	18%	40
47-3016	Helpers--Roofers	201	225	24	12%	10
47-3019	Helpers, Construction Trades, All Other	192	221	29	15%	9

SOC	OCCUPATION	2014 JOBS	2019 JOBS	CHANGE	PERCENT CHANGE	PROJECTED ANNUAL OPENINGS
49-2093	Electrical and Electronics Installers and Repairers, Transportation Equipment	248	256	8	3%	7
49-2096	Electronic Equipment Installers and Repairers, Motor Vehicles	109	108	(1)	(1%)	1
49-3023	Automotive Service Technicians and Mechanics	6,593	7,301	708	11%	327
49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	1,473	1,620	147	10%	65
49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	3,414	3,939	525	15%	219
51-4121	Welders, Cutters, Solderers, and Brazers	1,268	1,393	125	10%	60
51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	66	75	9	14%	4
11-1011	Chief Executives	6,746	7,158	412	6%	235
11-1021	General and Operations Managers	42,687	46,498	3,811	9%	1608
11-1031	Legislators	120	136	16	13%	6
11-3011	Administrative Services Managers	4,078	4,470	392	10%	149
11-3021	Computer and Information Systems Managers	13,215	14,984	1,769	13%	554
11-3071	Transportation, Storage, and Distribution Managers	1,464	1,526	62	4%	48
11-9013	Farmers, Ranchers, and Other Agricultural Managers	340	313	(27)	(8%)	6
11-9021	Construction Managers	3,976	4,205	229	6%	149
11-9041	Architectural and Engineering Managers	4,667	4,964	297	6%	180
11-9121	Natural Sciences Managers	2,023	2,101	78	4%	61
11-9131	Postmasters and Mail Superintendents	63	69	6	10%	3
11-9151	Social and Community Service Managers	1,620	1,937	317	20%	101
11-9199	Managers, All Other	32,462	33,486	1,024	3%	955
15-1111	Computer and Information Research Scientists	1,137	1,286	149	13%	49
15-1121	Computer Systems Analysts	18,997	22,720	3,723	20%	1081
15-1122	Information Security Analysts	8,295	10,034	1,739	21%	496
15-1131	Computer Programmers	6,812	8,233	1,421	21%	485
15-1132	Software Developers, Applications	28,747	34,708	5,961	21%	1611
15-1133	Software Developers, Systems Software	21,882	25,898	4,016	18%	1117
15-1134	Web Developers	4,523	5,423	900	20%	260
15-1141	Database Administrators	4,197	4,815	618	15%	210
15-1142	Network and Computer Systems Administrators	15,355	17,023	1,668	11%	595
15-1143	Computer Network Architects	8,233	9,285	1,052	13%	354
15-1151	Computer User Support Specialists	14,844	17,747	2,903	20%	842
15-1152	Computer Network Support Specialists	5,215	5,771	556	11%	198
15-1199	Computer Occupations, All Other	17,662	18,297	635	4%	423
17-2199	Engineers, All Other	5,574	5,755	181	3%	149
17-3011	Architectural and Civil Drafters	1,319	1,381	62	5%	36
17-3021	Aerospace Engineering and Operations Technicians	347	369	22	6%	12
17-3022	Civil Engineering Technicians	1,167	1,247	80	7%	45
17-3023	Electrical and Electronics Engineering Technicians	2,538	2,665	127	5%	83
17-3024	Electro-Mechanical Technicians	46	54	8	17%	3
17-3025	Environmental Engineering Technicians	131	191	60	46%	16
17-3026	Industrial Engineering Technicians	280	288	8	3%	9
17-3027	Mechanical Engineering Technicians	554	597	43	8%	22

TABLE A5.2: DETAILED EMPLOYMENT PROJECTIONS RELATED TO POTENTIAL FUTURE PROGRAMS

SOC	TITLE	2014 JOBS	2019 JOBS	CHANGE	% CHANGE	PROJECTED ANNUAL OPENINGS
17-3013	Mechanical Drafters	17,662	18,297	635	4%	423
19-4031	Chemical Technicians	1,167	1,247	80	7%	45
19-4091	Environmental Science and Protection Technicians, Including Health	4,197	4,815	618	15%	210
19-4093	Forest and Conservation Technicians	347	369	22	6%	12
19-4099	Life, Physical, and Social Science Technicians, All Other	15,355	17,023	1,668	11%	595
25-2011	Preschool Teachers, Except Special Education	28,747	34,708	5,961	21%	1611
27-4011	Audio and Video Equipment Technicians	4,667	4,964	297	6%	180
29-2021	Dental Hygienists	21,882	25,898	4,016	18%	1117
29-2031	Cardiovascular Technologists and Technicians	14,844	17,747	2,903	20%	842
29-2032	Diagnostic Medical Sonographers	5,215	5,771	556	11%	198
29-2041	Emergency Medical Technicians and Paramedics	4,078	4,470	392	10%	149
29-2053	Psychiatric Technicians	6,812	8,233	1,421	21%	485
29-2055	Surgical Technologists	3,976	4,205	229	6%	149
29-2057	Ophthalmic Medical Technicians	18,997	22,720	3,723	20%	1081
29-2061	Licensed Practical and Licensed Vocational Nurses	42,687	46,498	3,811	9%	1608
29-2071	Medical Records and Health Information Technicians	340	313	(27)	(8%)	6
31-2011	Occupational Therapy Assistants	8,233	9,285	1,052	13%	354
31-2021	Physical Therapist Assistants	5,574	5,755	181	3%	149
31-9091	Dental Assistants	120	136	16	13%	6
31-9094	Medical Transcriptionists	1,620	1,937	317	20%	101
31-9097	Phlebotomists	2,023	2,101	78	4%	61
33-1021	First-Line Supervisors of Fire Fighting and Prevention Workers	63	69	6	10%	3
49-2011	Computer, Automated Teller, and Office Machine Repairers	1,464	1,526	62	4%	48
49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment	32,462	33,486	1,024	3%	955
49-2095	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	1,137	1,286	149	13%	49
49-9062	Medical Equipment Repairers	1,319	1,381	62	5%	36
51-1011	First-Line Supervisors of Production and Operating Workers	13,215	14,984	1,769	13%	554
51-5111	Prepress Technicians and Workers	8,295	10,034	1,739	21%	496
53-2021	Air Traffic Controllers	4,523	5,423	900	20%	260
53-3032	Heavy and Tractor-Trailer Truck Drivers	6,746	7,158	412	6%	235